modern railways

JUNE 65

3/-

BRUSH Type 4 – 2750 h.p. Diesel Electric Locomotive, the most powerful single engine locomotive to enter regular main line service. Designed and built by BRUSH with Sulzer engines to the requirements of the Chief Mechanical and Electrical Engineers of the British Railways Board. □ The Type 4 has been adopted as British Railways' standard high power 2750 h.p. Diesel Electric Locomotive. □ 310 complete locomotives are being built by BRUSH, many of which are already in service. Also, 202 sets of engines, generators, traction motors and control equipment are being supplied by BRUSH for inclusion in Type 4 locomotives being built to BRUSH design in British Railways' workshops under a licensing agreement.

BRUSH ELECTRICAL ENGINEERING CO LTD

A HAWKER SIDDELEY COMPANY

Hawker Siddeley supplies aircraft, aerospace equipment, diesel engines, electrical power generation and distribution, electronics, alloys and general engineering products. World-wide sales and service.

BRUSH ELECTRICAL ENGINEERING CO. LTD.
Loughborough, England
Telephone: Loughborough 3131
Telegrams: Brush, Loughborough, Telex
Telex: 34531 Brush Loughboro

NEW TITLES

LOCOMOTIVE ADVENTURE VOLUME 2

H. HOLCROFT 42/-

This is the second part of the Holcroft memoirs in which the author tells of more than half a century of unique experiences on the locomotives of the Great Western Railway, the S.E. & C.R. and latterly the Southern Railway. He starts with an account of the circumstances which led to the starting point of his career and goes on to describe the days of his apprenticeship with the Great Western.

B. R. LOCOMOTIVES COMBINED VOLUME

12/6

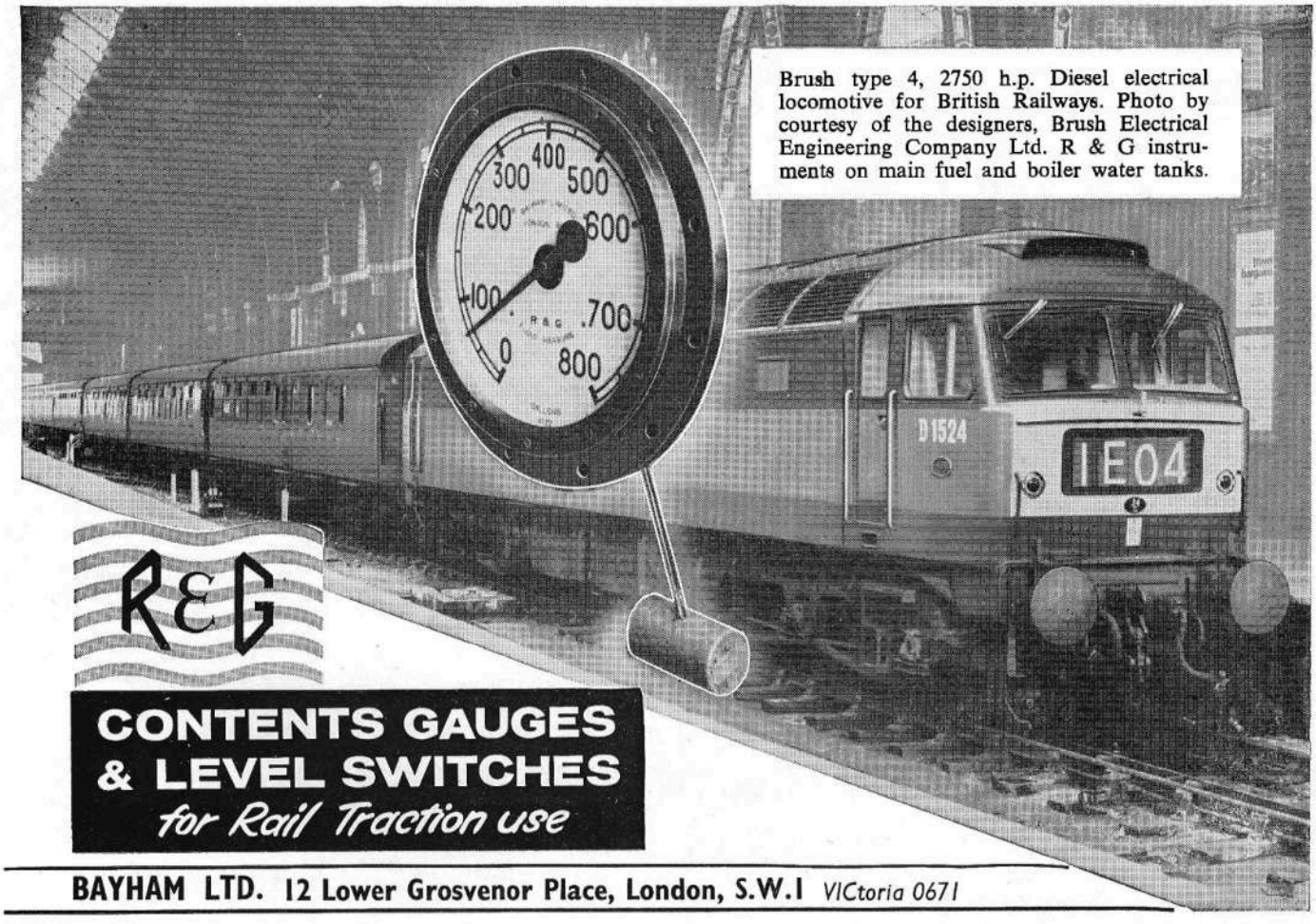
A complete list of locomotives in use with British Railways.

NORTH WESTERN ALBUM

COMPILED BY C. C. DORMAN 27/6

Portraying the L.N.W. in pictures, covering the period from the 1890s until it was amalgamated to form part of the L.M.S. in 1923, with portraits of famous locomotives, and some fine shots of trains in action in settings as widespread as London, North Wales and Carlisle. The photographs have been compiled from a wide range of sources and include works of well-known pioneer railway photographers.

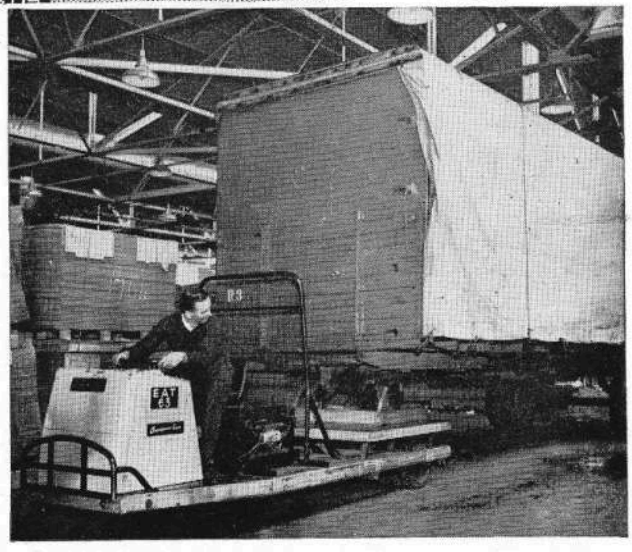
PUBLISHED BY IAN ALLAN TERMINAL HOUSE SHEPPERTON MIDDLESEX


Brush type 4, 2750 h.p. Diesel electrical locomotive for British Railways. Photo by courtesy of the designers, Brush Electrical Engineering Company Ltd. R & G instruments on main fuel and boiler water tanks.
R&G
CONTENTS GAUGES
& LEVEL SWITCHES
for Rail Traction use
BAYHAM LTD. 12 Lower Grosvenor Place, London, S.W.1 VICtoria 0671

CONVEYANCER-SCOTT

ELECTRIC TRUCKS AND TRACTORS

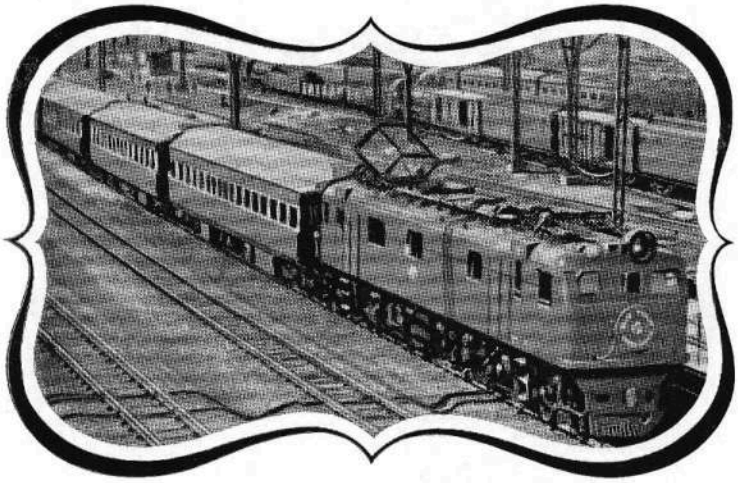
The Conveyancer Scott electric truck in all its various forms is being used extensively throughout Great Britain .... in station sorting offices of the General Post Office, in goods and passenger stations of British Railways, in factories, hospitals and in stores. Highly manoeuvrable, silent, smooth, fumeless, simple to drive and service, these rugged trucks are easily adaptable for many forms of carrying and towing. A wide range of tractors and elevating and fixed platform trucks is available. Illustrated literature free on request.



Conveyancer-Scott ELECTRIC VEHICLES LIMITED
LIVERPOOL ROAD · WARRINGTON
Telephone: 35922 Grams: HYDRAULICS WARRINGTON Telex: 62145
MEMBER OF THE OWEN ORGANISATION

SUBSIDIARY OF
EH
ELECTRO-HYDRAULICS LTD

Conveyancer equipment can be leased in the British Isles from Conveyancer Plant Hire Co. Ltd., address as above.



The SOUTH AFRICAN BLUE TRAIN

the last word in luxurious rail travel celebrated its silver jubilee in 1964. Twenty-five years have established it as one of the world's best known trains. METRO-CAMMELL are indeed proud of being the builders of these perennially comfortable coaches.

Over 25 Years of Luxury Travel

The BLUE PULLMAN

after five years remains the premier luxury stock on British Rail. In producing the whole train, including the coaches, METRO-CAMMELL prove their skill and versatility in design and production.

METROPOLITAN-CAMMELL LIMITED
(Railway Division)

Head Office: Saltley, Birmingham 8
London Office: Vickers House, Millbank Tower, S.E.1

modern railways

Incorporating THE LOCOMOTIVE RAILWAY CARRIAGE & WAGON REVIEW

Vol. XXI No. 201 JUNE 1965

CONTENTS

Is BR's electricity bill unfair? Fare schemes need co-ordination: workshops main task is repair: the new Chairman: signalling non-standardisation 301
Letters 304
Double-deck commuter coach is a highlight of BRB's rolling stock plans 306
The Midland Line's new diesel power control: Part 1 308
The cost of electric power supplies to European railways 315
Traffic Divisions of British Railways—4: Bristol: Part 2 316
The Brush "Hawk" 319
AEI diesel-electrics for Nigeria 322
British Railways and industrial design
1. A designer's look at BR rolling stock 324
2. A fig for the designers 328
3. A former PRO's view 328
4. Why BR needs a new design idiom 329
Stage 2 of the GC closure is scheduled this month 334
Joe Russell, Area Manager 335
Train running and traction performance 340
The ER gets ready for its first merry-go-round 344
Newhaven car terminal is opened 345
Today and tomorrow 346
Beyond the Channel 353
Traffic report 357
The Irish scene 361
New books 362

Editor: **G. FREEMAN ALLEN,** Assoc.Inst.T.

Published by:

IAN ALLAN

Terminal House,
SHEPPERTON, Middlesex.

Telephone:
Walton-on-Thames (WT) 28484

Annual subscription rate:
40s (home) } including
43s (overseas) } postage

Second class postage paid at New York Post Office, N.Y.

MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Is BR's electricity bill unfair?

"IF we could get the price of current down by 0.1d a kWhr," a BR engineer was grumbling the other day, "electric working from Weaver Junction to Carlisle would be viable right away." This remark, which suggested that a cut of only about 8 per cent in CEGB charges would significantly influence the havering over continuation of the LMR a.c. electrification, was off the cuff and should not be taken as a precise calculation. But it points up a crucial factor in the economic debate on further BR electrification which has had too little attention.

In France and Western Germany, as a short survey elsewhere in this issue makes plain, the national railways get their current supplies at rates that are calculated to encourage electrification as a national asset. But not so in Britain. Throughout the 1950s and until last October the nationalised concerns were exhorted politically to practise the self-interest of private enterprise in their dealings with each other, as well as in their business with the public at large. Amongst other absurdities, this results in a fairly strict application to BR of the requirement that the CEGB should in no way favour or discriminate against any concern taking current supplies direct from its lines.

Both the BRB and the CEGB are reluctant to discuss the detail of BR's electricity tariff, but it is obviously anomalous in many respects by comparison with what obtains across the Channel.

For example, BR apparently make a handsome contribution to the CEGB's extravagant publicity campaign to persuade the public to "switch on" to domestic cooking, heating and so on, and reject the blandishments of "high speed gas". Like other customers, the railways are levied a percentage on their gross current bill which is appropriated for vaguely defined enterprises by the electricity authority, allegedly on behalf of all its clients; a proportion of this percentage—which, applied to the overall BR account, amounts to a tidy sum—is channelled into promotional advertising. A profit margin for the CEGB is almost certainly embodied in the charges to BR in respect of the capital investment in generating plant to meet railway demands.

It is arguable, too, whether BR should be charged a similarly-based tariff for current throughout its electrified network. BR's three-part tariff comprises: a maximum demand charge, which is related to expense of meeting the maximum national demand for current in the morning and evening peak; a fixed charge per unit; and a coal price adjustment element. On a commuter network like the Southern's, it is perhaps logical that the railway should pay for the extra generating resources its intensive peak service requires. But on many sections of the LMR electrified main line the railway will be helping substantially to spread the generating load by posing its peak demands for current in the later evening, when the heavy freight is occupying much of the track capacity. Moreover, with its

SR 4-SUB electric multiple-units on Hampton Court–Waterloo (left) and Waterloo–Kingston services pass at Raynes Park on April 6. The SR's d.c. electric network is one of the CEGB's major customers in Southern England. *Photo by C. T. Gifford*

precisely timetabled service, the railway should be able to forecast its current requirements with far more precision than many industrial users; it should not need to be mulcted of any additional charge imposed on users generally to bridge the gap between forecast and actual demands.

The price of current to BR is a critical issue because the slightly superior economics of diesel over electric traction on a train-mile basis, in the existing cost conditions, still seem to be one of the main factors in the balance against electrification from Weaver Junction to Glasgow, even with the concentration on the West Coast Route of the additional traffic proposed in the BRB's trunk route survey. A new complication is the greatly increased trainloads advocated in this survey, which will add to traction costs; it was computed that the existing all-purpose a.c. locomotives could lift 950-ton freight trains over Shap and Beattock at 50 m.p.h. at least, but the trains of 1,500 tons and more now envisaged will require either double-heading, more locomotives geared primarily for freight duty, or a new mixed-traffic design of considerably enhanced power. In consequence either flexibility of utilisation will be reduced, or the expense of a new design will have to be faced.

For the rest, however, the experience and expertise acquired south of Crewe make the extension beyond Weaver Junction look steadily more promising. There seems to be general consent that the catenary can be simplified and the current feeder installations cheapened; new possibilities of cutting the telecommunications costs are being explored. There might even be scope to accelerate the work north of Carlisle immeasurably by giving the engineers continuous possession of long stretches at a time and diverting all traffic between Carlisle and Glasgow via the GSW route. There would be undoubted difficulties of maintaining a service to certain townships on the Caledonian route during such a closure, but they do not look insuperable. What the chance to forge ahead with the work uninterruptedly might mean financially can be gauged from the SR's assessment that each week shaved from the duration of the Waterloo–Bournemouth electrification reduced the total bill by £40,000.

Fare schemes need co-ordination

Bargain fare offers from BR are getting almost as frequent as detergent giveaways. Another NER range of cut-price tickets is reported on this month's news pages and as we go to press the announcement of a striking new SR cheap-fare policy is imminent. Plainly commercial officers are finding it possible to strike fare levels low enough to attract the public to off-peak services, yet adequate to make a worthwhile addition to net revenue. The new WR weekend facility is reported strikingly successful. In the NER, especially, the results of steadily bolder enterprise in this respect have been heart-warming and an attractive brochure this Region has just produced, cataloguing all its travel bargains, is a model of go-ahead promotion.

But why is there no all-line catalogue of the same kind? Across the Channel, where fare discounts are standardised throughout the national system, it is easy to preface the public timetable books with a concise account of every concession obtainable. Ultimately both railway and public will probably do better financially out of the independent Regional approaches that have been encouraged in this country, because the specific market research and commercial appraisal of individual routes and services which are evolving on BR will more precisely compute the best deal for both sides in any given circumstance. (On the other hand, Regional autonomy seriously complicates the commercial approach to inter-Regional services; this may make it difficult, for example, to apply any simple two-tier fare scheme to next year's LMR electric main-line working, because the traffic will include so much inter-Regional movement.) But the public image of BR as a unified concern will be just as much confused as it is alleged to have been by Regional styles and liveries unless there is more patent effort to co-ordinate bargain fare schemes. A seasonal all-line handbook to the bargains on offer in each Region is badly lacking. More than that, a close look is needed at some of the roughly similar facilities which Regions offer at slightly differing discounts under their own local brand names, to see whether more standardisation is possible at a common discount rate and under a national brand name.

Workshops' main task is repair

The Minister of Transport's recent promise of legislation to free BR workshops from manufacturing restrictions revived some national press speculation that BR would start to survey the locomotive export field. One does not believe that the BRB seriously entertains the idea, but some union quarters may. At this juncture it would be ludicrous. The fundamental job of a railway workshop is to maintain the railway's equipment, not build it, and BR workshops have lately fallen sadly short in their main function. It is ridiculous even to dream of extending manufacturing activity at any BR plant when at least one private firm is currently taking in BR locomotives for heavy repairs. The rationalisation of the workshops reduced BR locomotive repair facilities to a capacity based with blithe optimism on a multiple of the number of locomotives allocated to each workshop for heavy repairs and the number of scheduled overhauls each would normally undergo in a given period. In other words, it assumed almost immaculate performance and a charmed life for every unit in the fleet. There seems to have been inadequate provision for chance damage or modification work. At the same time, the new construction quota of several workshops was increased to re-absorb men who would otherwise have been made redundant. The net effect, combined with stringent reduction of the stock of spares held at some works, has been the costly immobilisation of diesel traction for lengthy periods and some serious cases of poor workmanship attributable largely to a confused reorganisation. Until the upkeep of existing diesel locomotives has been put on a sound footing—and one is not suggesting that contract maintenance by manufacturers should be excluded; it has obviously been a potent factor in the success of the "Deltics"—talk of expanding the new construction output of BR workshops is naive.

The new Chairman

Applause for the choice of Mr. Stanley Raymond to succeed Dr. Beeching as Chairman of the BRB is rightly all but unanimous, both within and without the railway. More than once in his comparatively rapid ascent to the top since he joined the BTC as Assistant Manpower Adviser in 1955 Mr. Raymond left sharp marks of his passage. What was bruised, however, was almost always introverted complacence with the way the job had been done since the days of Milne, Stamp and the rest. Practically all who have felt the Raymond spur now readily concede its stimulus and add their testimony to his energy and clarity of thinking about the role of a twentieth century railway. Of course, Mr. Raymond will pursue the Beeching policies. But those to whom this instinctively implies only contraction should remember that hitherto Mr. Raymond has been the Board member with commercial responsibility, and that it is under his general direction that the railways' aggressive, increasingly sophisticated—and steadily more successful—marketing campaign for new passenger and freight traffics have been developed. Not the least satisfying aspect of Mr. Raymond's appointment is that the industrial updating of BR is now regarded as so effectively advanced that a railwayman is once again the obvious choice to head the business. A *Sunday Times* editorial alone attacked Mr. Raymond's appointment because of his railway background, on the grounds that this would blind him to the scope for technological change which the railways must explore if they were to survive. It is the *Sunday Times*, however, which is blind. The research workers and establishments of BR—and BR's research facilities are now without equal in the Western railway world—are already verging on the knowhow to revolutionise the system by comparison with the fully manned, conventionally signalled and operated network we presently call a railway. All that lacks is the sure commercial justification for putting their theories into practice and far "out-Tokaido-ing" the Japanese. Now if the *Sunday Times* could tell the new Chairman how to prove to the Treasury that a fully-automated main line will justify the enormous first costs of conversion . . .

Signalling non-standardisation

Many BR lines not scheduled for intensive development in the recent trunk route survey may be earmarked for partial modernisation, including a measure of resignalling. It is hard to see how some of them will show sufficient traffic to justify such resignalling unless new ways are found of reducing installation and maintenance costs. Speaking to the Institution of Railway Signal Engineers recently Mr. H. C. Johnson, General Manager of the LMR, urged operators and engineers to simplify track layouts and reduce the complexity of signalling equipment in order to cut high signalling costs. He might also have put the case for standardisation of practices and components in all Regions. Despite the trend towards centralised management in many departments, Regional signal engineers are largely autonomous. While the BRB's

Concluded on page 315

Mr. S. E. Raymond, Chairman of the BRB.

letters

British Railways and the timber trade

SIR,—In your May issue you referred to the annual dinner of the Timber Trades Federation and quoted the Federation's President—Mr. Bruce B. Kennedy—as saying "that during the last year relations with British Railways have suffered grave deterioration" because of the "manner of imposition" of increases in charges for dock haulage and demurrage.

In saying this Mr. Kennedy has been less than fair to the railways. In fact, for the past year they have been engaged in detailed discussions with the Federation and the British Transport Docks Board in an effort to determine whether costs could be reduced by improved methods of handling and movement. The three parties had jointly engaged consultants at several ports and whilst these investigations were taking place the railways had agreed a moratorium on rates increases, Mr. Kennedy mentioned these discussions at the Annual Meeting of the Federation on March 4—the day after the annual dinner—and said that they had won the industry a year's grace and saved it some hundreds of thousands of pounds.

The background to the matter is that the railways have been making a very substantial loss on the haulage of timber within dock areas and that, in consequence, we have had to increase our charges to cover costs. These costs reflect the nature of dock operations and the consultants have not been able to make any suggestions for improving methods of operation which would enable us to reduce our charges.

British Railways Board, S. C. ROBBINS,
London, NW1. *Chief Marketing Manager.*

The Stoke Division

SIR,—I do not consider Mr. F. O. J. Otway's comparison* (*April issue*) between the heavy local services of the Southern Region or the Glasgow suburban services of the Scottish Region and those which are to operate initially over the Trent Valley line of the London Midland to be a valid one. The bulk of the commuter travel out of Lichfield and Tamworth, for example, is into Birmingham.

Nevertheless, if traffic between the Trent Valley line stations and London justifies it, the proposed two-hourly interval service will be adjusted to cater for an increase.

If it should be decided at some future date to extend electrification of the London Midland the possibility of electrifying the Kidsgrove–Crewe line would not be overlooked.

Dealing with B.D's comments in the May issue, the car parking problem at Trent Valley is, in fact, under examination at the present time; it is by no means an isolated one.

The cancellation of the 8.10 from Leicester to Nuneaton Trent Valley was carried out two years ago along with most of the other trains in this service; the volume of passengers from Leicester and Hinckley changing at Nuneaton into trains going north simply was not large enough to justify trains for this purpose.

Another cancellation, that of the stop in the 19.40 Euston to Perth, and the insertion of a stop in the 19.30 Euston to Stranraer, was done deliberately to improve the lot of the Nuneaton passengers making long journeys to Scotland and Northern Ireland.

The train at about 17.00 was the Perth to London, which called at Nuneaton when it was a locomotive changing point. The stop was not used sufficiently to justify its continuance. In the new electric timetable of April, 1966 a local train will leave Nuneaton for Rugby at 17.30.

Stoke, LMR, GEORGE DOW,
British Railways. *Divisional Manager.*

SIR,—Electrification of the Crewe–Kidsgrove line has been one of those muddled on-off, on-off affairs. The Crewe Electric Control room already includes a diagram showing proposed electric feeding arrangements. Only six bridges would have to be lifted, of which one is a very simple steel girder cattle crossing. Mr. Otway mentions the possibilities of electric through working of freight trains from Edge Hill, Garston, Runcorn (Folly Lane) to yards in the Potteries area, which would greatly simplify things, but his suggestion of an extension of the Liverpool–Crewe local passenger service to Stoke is impracticable. Firstly, the LMR would be unlikely to consider a curtailment or cutting back of the existing hourly Crewe–Derby d.m.u. service (through bookings between Stoke and Merseyside are very few outside the summer peak). Secondly, an added conflicting movement would be imposed on Crewe South Junction. However, I see no reason why there should not be a peak-hour through working and the one or two trains to Stone and Stafford via Stoke, starting from the Derby bays at Crewe clear of the main up and down through lines, could be handed over to e.m.us. Electrification of this section would also give a short access route from Stoke to the Crewe District Electric Depot.

Crewe. H. J. PLANG.

BR must pursue a continuous traction policy

SIR,—The second paragraph of a correspondent's article on page 208 of the April issue, dealing with the chaotic way in which BR entered the diesel era, wants some correction. He is right enough about what happened in general, but it needs to be remembered that there was one island of sanity in the midst of the confusion.

The Southern was perhaps lucky in having a strong tradition of electric traction on which to base its diesel plans. Possibly it was more favoured by having the benefit of a large part of what early experience there was of the pioneer main-line diesel locomotives, although there is no obvious reason why the rest of the system should not have taken advantage of these factors too.

But whatever the reasons, it is fact that the Southern came through the panic introduction of BR diesels in a condition to which the rest of the concern is only beginning to aspire. They have but one type of line locomotive and would obviously never have called for more than two to meet all their needs even without electrification. Moreover, that one type was well ahead of its time—and for that matter, ahead of even present BR thought in that it embodies features like the air brake, towards which general practice is still slowly and painfully evolving. The calculated substitution of electric for steam train heating not only made use of unhappy experience with the early boilers and of realisation of the extent to which dependence on water supplies reacts against high utilisation to pave the way towards an altogether more modern and serviceable way of heating trains, but also made possible a high power-to-weight ratio for freight service. These must surely be the smallest and cheapest locomotives regularly entrusted on BR with the haulage of 1,000-ton trains—and on the GN main line at that.

After all this time it is almost amusing to see from Brig. Langley's article in the March issue that the new standard driving position, with its provision for the driver to ease his lot by driving while standing on occasion, is so close to what was provided on these unsung Southern locomotives. It is to be hoped that the Brigadier, being a tall man, will have spotted the need to watch the floor level so that drivers will not have to stoop to see forward, but there is still no sign of understanding of the importance of dual controls to ease single manning when any significant amount of shunting is required.

Maybe these machines were too far ahead of their time for appreciation of their features by an engineering staff at headquarters who were being driven somewhat bewildered out of their cosy ancestral cloud of steam. But it does seem a pity that we should now be faced with a heavy bill to put right what need never have been wrong in the first place—and the bill will be heavier still when mistakes being committed even now are at last recognised. However, at least a little recognition should be given to those who did avoid the trap rather than condemn them with the rest.

YOUR ENGINEERING CORRESPONDENT.

Outlook for the Southern's passengers

SIR,—I found your interview with the General Manager of Southern Region (*April issue*) extremely interesting, but was appalled by Mr. McKenna's narrow outlook in respect of potential cross-London traffic. So British Rail passengers are to be denied improved facilities such as through services because BR management have not sufficient faith in their ability to operate trains punctually? One would think that services crossing London and running from the southern to the northern limits of the conurbation would fill a pressing need in the travel pattern and prove very attractive to passengers—and some motorists. Any traveller knows how inconvenient and exhausting a cross-London journey is today, although I doubt if Mr. McKenna does. What he does not appreciate (and he is in company with most other members of BR management) is that on a cross-town journey of 15–20 miles the time spent in changing and waiting for the next train onward can often exceed the actual movement time: such journeys are much more attractive and convenient by car.

A determined plan to connect the termini with cross-town tunnel rail services would enable bus services to be reduced to their proper role of rail feeders.

London, E10. E. RELTON.

SIR,—Having tried out the new SR Brighton sets on the 8.20 Brighton–London Bridge and the 17.02 return working I must say the reduction in noise level and the improvement in riding is noticeable. However, the less said about Mr. McKenna's favoured interior the better. Apart from a few Design Panel touches (luggage racks, moquettes, finishes to walls, etc.) these trains are 1951 in concept, with doors in all

the wrong places. People walking forward to the front of the train—as they do at peak periods—before the train stops, find that they must exit through a first-class compartment door, as the vestibule immediately behind the driver is kept locked and marked "no exit" (this is for safety reasons). When a 12-car train is formed, with miniature buffet in the centre of the middle set, the walk from the furthest first-class portions (and the number of doors to push, pull, or slide) will deter all but the most enthusiastic. If these standards suit Mr. McKenna let us be thankful that the Bournemouth line will be his last opportunity to practise them.

H.B.

(Full name and address supplied.)

The Broad Street—Richmond line

SIR,—Your report of the latest developments on the Broad Street–Richmond Line (*page 233 of your April issue*) quotes only the views of the London Midland Region. The result is a distorted picture of what is happening. The London Midland Region has been repeatedly challenged in the local press to produce evidence to justify their latest "economies"—the closure on Sundays, as from March 7, of four stations on the line. They have produced no evidence that these stations were losing money on Sundays or that they lost more money than other stations.

Your report attributes to British Railways the view that these closures may cause "some inconvenience to a small number of travellers". This is untrue. Again LMR have made no statement about the numbers that will be affected by the closures. However, a census was undertaken under the auspices of the Broad Street/Richmond Line Joint Committee, to which are affiliated eight separate committees from boroughs along the line, all fighting to retain its passenger services.

On one or other of the last two Sundays on which trains ran at the affected stations, the numbers boarding and alighting from each train were counted. At South Acton the total boarding and alighting from trains was 223; at Kentish Town West: 316; at Caledonian Road: 749; at Canonbury: 529.

The Joint Committee admit that this was a rough and ready census. It was unfortunate that it could not be completed on a single Sunday. But it was the best that amateurs could do in the time and faced with LMR's refusal to publish figures. In fact, our figures have been published locally and BR have not challenged them.

Granted that there must have been some overlapping of the passengers counted at the four stations, it is still hard to see how they can be described as "a small number". It should also be remembered that the census took place on two cold February days when the leisure traffic which the line carries to Hampstead Heath, Richmond and Kew was at its lowest ebb.

You report also that LMR is postponing making any closure proposals for the line as a whole "until further studies into the viability of the service" have been completed. What are these studies? Ever since the Beeching Report listed the line for closure in March, 1963 further studies have been going on. Repeatedly dates have been set for a definitive proposal and then postponed. As recently as December 11 last year Mr. Stephen Swingler, MP, Parliamentary Secretary to the Minister of Transport, told the House of Commons that BR would bring forward their definitive proposals for the line "very soon indeed". This latest delay belies that promise.

Passengers on the line derive no comfort from these postponements. Since the autumn of 1962 they have seen the frequency of trains on the line reduced, the late evening weekday and early morning Sunday services withdrawn and now services removed completely from a quarter of the line's stations on Sundays. All this has been done—quite legally—without any public enquiry and without the production of any evidence to justify these "economies". Passengers naturally fear that this piecemeal lopping of services, combined with BR's contemptuous refusal to take the public into their confidence, mean that the line's usefulness is being deliberately reduced to the point where it can be finally abolished with the minimum of fuss. After all, it has happened before.

CHRISTOPHER HALL,
Chairman.
Broad Street–Richmond Line Joint Committee.

An article in last month's issue described a plan which the Southern Region is discussing to transform the concourse of Waterloo station. This artist's impression shows how some of the kiosks might be rebuilt; beyond is the screen proposed from roof to platform barriers, which would shut off the train working area from the concourse.

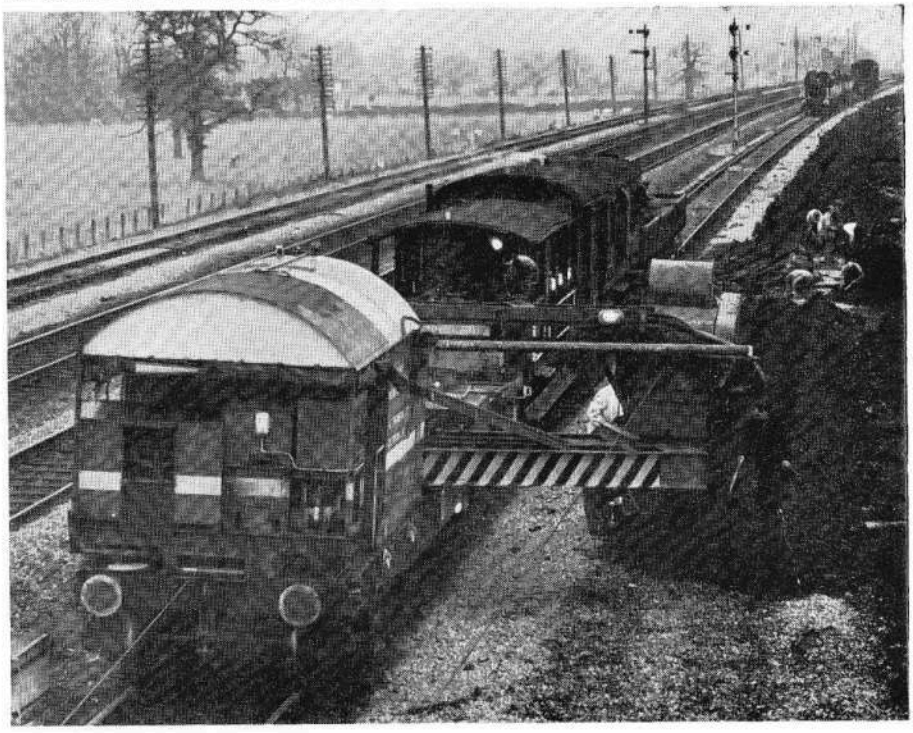
Pullmans off the "Talisman"

SIR,—The withdrawal of the Pullman sections from the "Talisman" sets is understandable if one studies the vehicles which were available for these services.

Until April 12 the GN and East Coast

Concluded on page 334

A rail-mounted mechanical trench digger employed by the WR in preparation for cable-laying for resignalling. The trench digger is closely followed by a cable-laying train, seen in the right background, which can deposit a number of cables simultaneously in the freshly cut trench.



Integral construction, better soundproofing and electrical train heating—these are the chief probabilities in coaching stock. Much more visionary is the thinking on freight stock, which extends to possible gauge enlargement and track strengthening on selected routes so that 4,000-ton trains of 120-ton bogie wagons might materialise

Double-deck commuter coach is a BRB's rolling

A TENTATIVE design for an articulated double-deck train, intended to help solve the problem of persistent clamour for increased commuter-carrying capacity in the South Eastern Division of the Southern Region without excessive expense on fixed installations, is the most startling feature of new BRB approaches to rolling stock design. Two experimental four-car double-deck units designed by O.V.S. Bulleid were introduced on the Southern Region in 1949, but did not prove successful. The idea was subsequently abandoned in favour of increasing the maximum permitted train length from eight to ten cars, though the two prototypes remain in service.

The inherent fault with the Bulleid design was that it attempted to fit the concept of a double-deck train into what was virtually a standard carriage shell—or quite simply, to get a quart into a pint pot. As there was only a fraction over 9ft between floor and roof, the compartments had to be arranged as a series of overlapping boxes with the upper and lower levels interconnected by narrow stairways. The effect was claustrophobic and the public complained of being cramped. But what really damned the idea was that, in spite of doors to the lower compartments, loading and unloading during the peak periods mostly exceeded the permitted station time of 20 seconds, with the result that schedules were not maintained.

Nevertheless, the experiment demonstrated the possibility of achieving a 30–50 per cent increase in seating capacity per vehicle compared with standard stock. A 25 per cent increase per train was gained by the introduction of 10-car formations and this was considered enough to shelve the double-deck experiment. Perhaps it was hoped that the demand would stabilise. Peak-hour commuter traffic on the Southern Region has, however, steadily swollen and travelling conditions in the SE Division of the Region provoke constant complaint. Official reaction seems to be a tacit acceptance of stalemate; if more trains cannot be run, then more passengers cannot be carried—unless they pack themselves in more tightly. Against this background the case for double-deck trains is strong and the fact that the concept has now reached the design stage suggests that the BRB would welcome its adoption by the Southern Region.

Cartic 4 is design basis

From what is known of the present design it is at least clear that every effort has been made to avoid the mistakes inherent in the Bulleid stock. Using the Cartic 4 car-carrier design as a basis, it has been possible to allow sufficient space between floor and roof to accommodate upper and lower saloons with approximately 6ft headroom, thus dispensing with separate compartments and a multiplicity of doors.

Loading and unloading would be through wide end doors leading into vestibules giving direct access to the upper and lower saloons via short stairways. The doors would be of a width at least equal to that of the rear loading platform of a double-deck bus and would probably be of the automatic folding type, controlled by the train crew. With doors of this width the designers claim that loading and unloading would proceed simultaneously; for this reason all gangways and stairs would be wide enough for passengers to pass freely in either direction. To permit this, seating has been restricted to two abreast on each side of the gangway, giving a total of 92 seats per car—44 in the lower saloon and 48 in the upper.

An important feature of the design is that the overall length of each car between the articulated bogie centres is only 46ft. This is dictated by the need to keep the axle-loading within the permitted limits, but it also facilitates unloading in that no passenger would be more than 20ft from an exit door. This is less than the distance from front to rear of a London bus body.

Whether or not there is any real need for the inter-car corridor connection embodied in the design is a moot point. It could be a help to passengers in finding a seat, but it could also be a serious nuisance by encouraging them to circulate—and to bunch at the forward end when a train approached its London terminus.

Assuming that a train is composed of 46ft cars throughout, 14 of them would approximate to the length of a standard ten-car train; 14 x 92 gives a total seating capacity of 1,288, or slightly higher than that of the Bulleid double-deck stock (excluding its tip-up seats). Driving compartments would not affect seating capacity as these would use vestibule space. The approximate standing capacity is not known, but in view of the vestibules and the wide gangways it would be very high. Such a train could certainly take a complement of 1,750 without overcrowding.

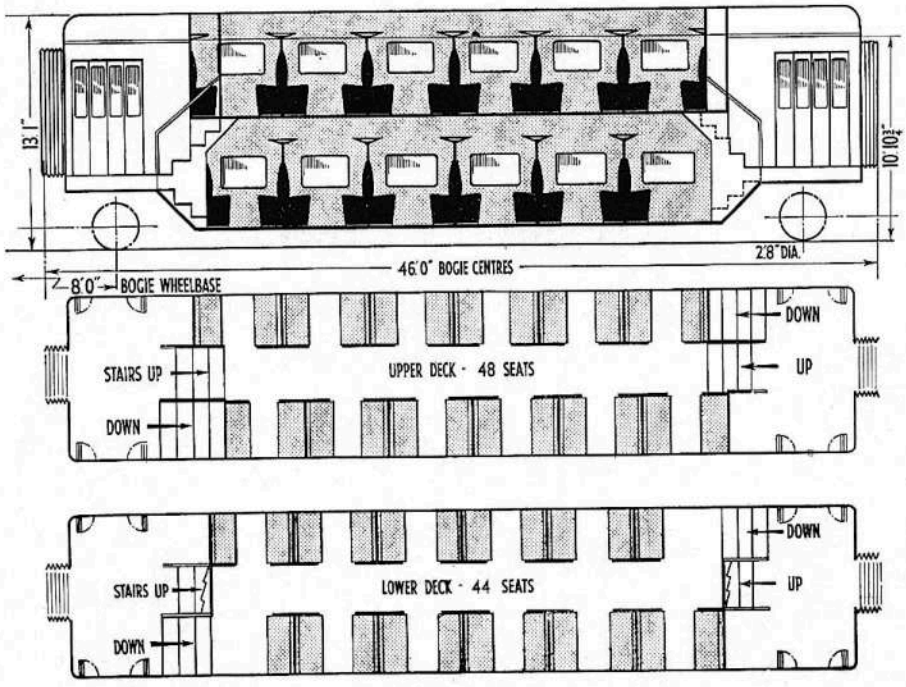
Although the actual seating capacity of the proposed double-deck train would exceed that of a normal 10-car train by only 31 per cent, the total carrying capacity would allow for 500 extra passengers without overcrowding. This represents an effective increase of about 40 per cent.

Plastic body shows promise

Among other current developments in BR passenger stock design, the trials that have been in progress for some months with two plastic-bodied coaches are likely to lead to a standard design of this character within three years. A plastic body will be about 8tons lighter than one of the present orthodox pattern. Henceforward, all new coaching stock bodies are being constructed on the integral principle, which economises some 2½tons by comparison with stock embodying separate underframes. Early shortcomings in the riding of Type B4 and B5 bogies are ascribed to indifferent workmanship, which has now been corrected, and BR engineers are confident that riding problems have been largely surmounted; further improvement might accrue from a new approach to tyre profiling, which would also add significantly to tyre life.

With riding problems virtually solved, renewed attention is being paid to other matters influencing passenger comfort (although BR engineers are anxious to abandon the extra-width folding entrance doors introduced on the

highlight of stock plans



An artist's impression of the probable look of one vehicle of the articulated double-deck commuter train which has been designed by BRB engineers with Southern Region services in mind.

XP64 prototype stock; their replacement by sliding doors is now a possibility). Pressure ventilation is to be standardised, except for Pullmans, which will be fully air-conditioned, and hopes are held out of improved sound insulation by the use of new techniques. Although the mechanical fallibility of train-heating boilers has been greatly reduced to a level of 3 per cent of failures attributable to this cause, the scope for defects to arise from operational staff's mistreatment remains a problem. This is the chief reason for a probable switch to electrical train heating on all locomotive-hauled stock. It is now felt that the extra costs will be more than compensated by fewer train-heating failures that immobilise traction units.

More special-purpose stock?

The BRB recognises, to quote a spokesman recently, that the bulk of the BR wagon fleet is "hopelessly out of date". Individual payload capacities are inadequate; and braking and couplings are unsuited to the individual train loads and speeds of 50 or 75 m.p.h. envisaged in the trunk route plan. A new generation of freight stock is under development, of which the first fruits will be the 1,880 32ton capacity, brake-fitted coal hopper wagons now on order for merry-go-round and other workings. Production orders for the Cartic 4 double-deck car-carrier have been placed (this vehicle, incidentally, has now been accepted for extensive motorists' car-carrier train use). As MODERN RAILWAYS has already reported, the air brake has been standardised for future construction.

If the Channel Tunnel's advantage of through rail communication with Europe is to be exploited with adequate profit by BR, it is imperative that freight transits from any part of the Continent should run direct to the main industrial centres in Britain and vice versa. This implies that BR will have to adopt UIC standards, so that Continental rolling stock can operate freely to selected railheads. In admitting that a decision on this matter would have to be reached in the near future, a BR spokesman said recently that as a preliminary step the loading gauge would need to be increased by a foot on routes selected for international traffic, and that sharp radius curves at specified railheads would have to be modified, or old-fashioned depots completely reconstructed, to accommodate long-wheelbase Continental wagons.

Although BR has reduced its wagon stock by over 40 per cent in the past ten years, the present total of approximately 600,000 vehicles is still twice the number used by the SNCF for a comparable amount of tonnage. Further progress in stock reduction looks like being more difficult, as the point has now been reached when this depends essentially on three factors; replacement of existing stock by vehicles of larger capacity; improved turn-round times; and progressive elimination of short-haul workings.

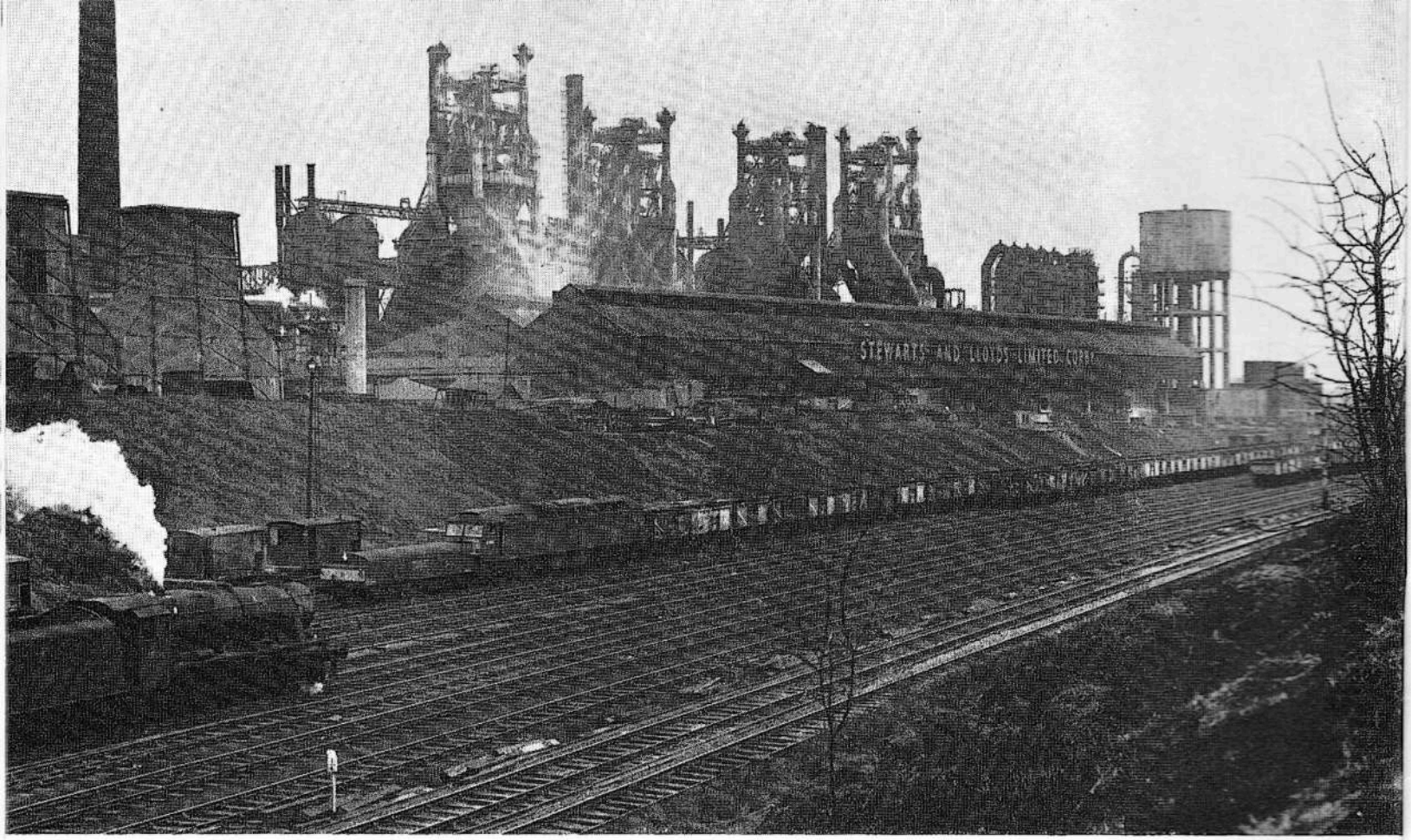
The greatest need at the moment appears to be for more special-purpose wagons. At present too much time is spent on improvisation, and the results are often inadequate protection for the load and the inconvenience of reduced operating speeds. On the other hand special-purpose wagons need thorough economic justification. Full utilisation is often impossible, and the vehicles may end up hundreds of miles away from where they are wanted at a given time, making them prone to an excessive mileage of empty stock working.

There is now a plan to evolve three standard wagon chassis, which will be adaptable to a wide range of fixed and demountable bodies, the latter including Leapfrog-type tanks for the conveyance of bulk liquids. BR may also try mechanised tipping bodies for mineral traffic.

Contrary to what might be expected, there is at present no indication that BR is yet standardising on long wheelbase four-wheel stock, despite its greater stability and safer running at high speeds. The latest development is a short-wheelbase design with Continental-type springing, which BR are confident will run safely at speeds of up to 75 m.p.h. This will avoid the expense of relaying a good deal of existing siding accommodation.

30-ton axle-loading possible

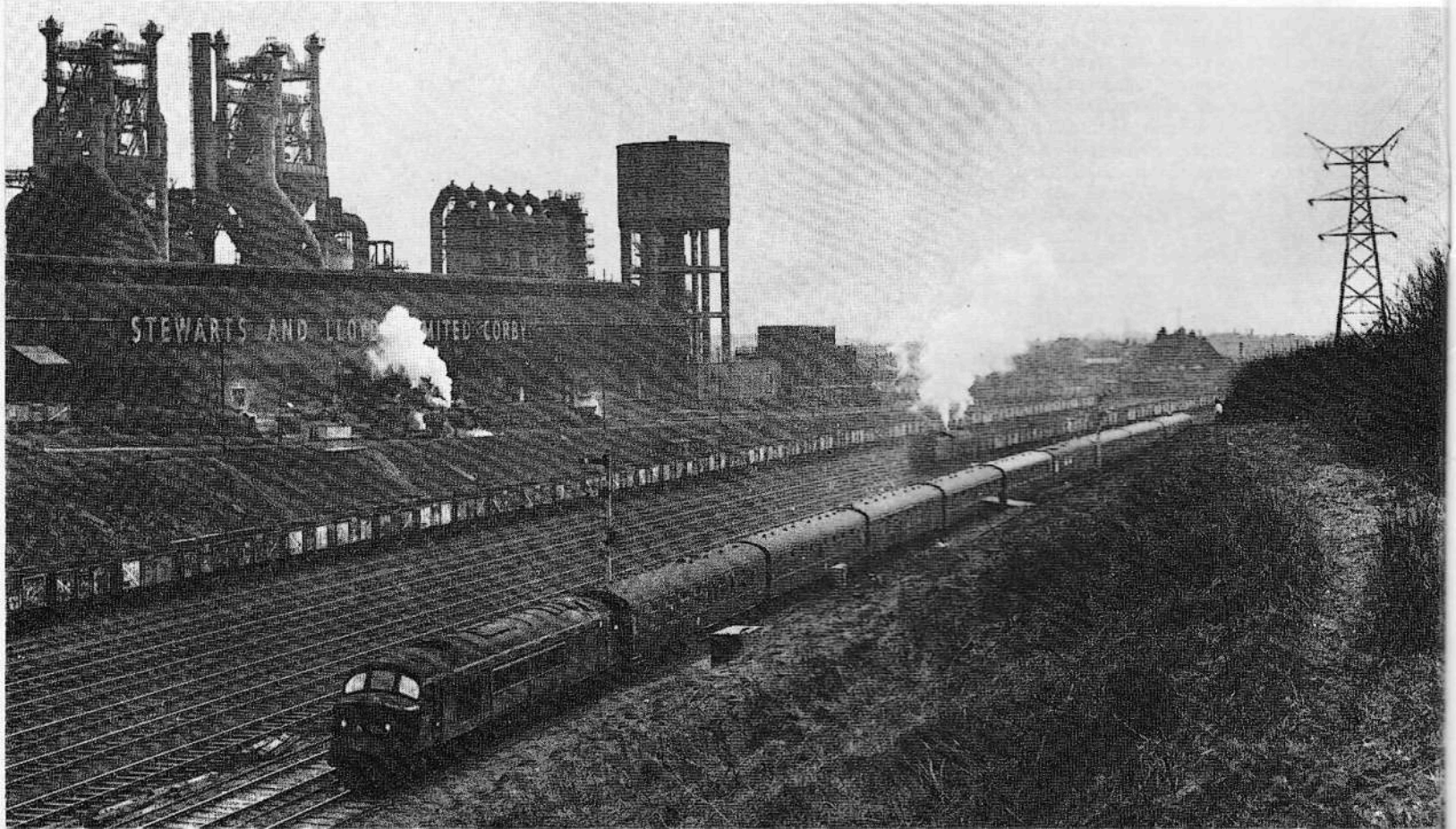
A particularly uneconomic feature of BR freight working is an average trainload of less than 150tons (as compared with 1,200tons in the USA), owing mainly to the proximity of many important towns and the large number of minor depots. However, an important contributory factor is the present maximum trailing load limit of 1,600tons. It is intended to increase this upper limit by at least 1,000 tons in the near future, but at the moment the BRB will not go ahead with new drawgear design because it is anxious to conform with the UIC standard design for an automatic coupler which is now evolving. However, all new wagons are being made suitable for later application of centre couplings. On the subject of axle-loading, the BRB is in favour of a general increase to 25tons and would like a maximum of 30tons on certain specified routes in order to operate 120ton bogie wagons. Trains of up to 4,000tons gross load are definitely foreseen on certain routes carrying heavy freight traffic. One candidate is the Highdyke–Scunthorpe flow of iron ore, for which a 70-car rake of 56-ton hoppers might be used in circuit working.



THE MIDLAND LINE'S

Warren Smith

I—Why the LMR has



IEW DIESEL POWER CONTROL

s abandoned depot allocation and strict adherence to diagram by its main-line diesels

THE inevitably chequered development of diesel traction on BR, in view of the haste with which it was carried out, has exercised management as much as any of its problems in the past few years. A relatively high failure rate has been reflected in low availability. To combat the continuing poor level of performance that has resulted, the Midland Line of the LMR on January 11 inaugurated a new form of power control which it claims to be more effective.

The scheme is remarkable for its boldness in departing from long-established practices in traction control. It provides for all main-line diesel locomotives to be common user—not that the common user concept is new; in this case, however, the locomotives have no home depot at all. For practical purposes the fleet is split into four groups. One group is allocated to the Line, the remainder one apiece to each of the three Divisions. The principal records of locomotive history, etc. are kept in the Line Maintenance Engineer's Office.

A second fundamental change from traditional practice is that no particular virtue is seen in adhering rigidly to diagrams any longer. The diesel controllers are encouraged to break them if by doing so better overall utilisation can be achieved. Furthermore, maintenance is now based strictly on engine hours (as defined later on), rather than on the more usual days or weeks in traffic.

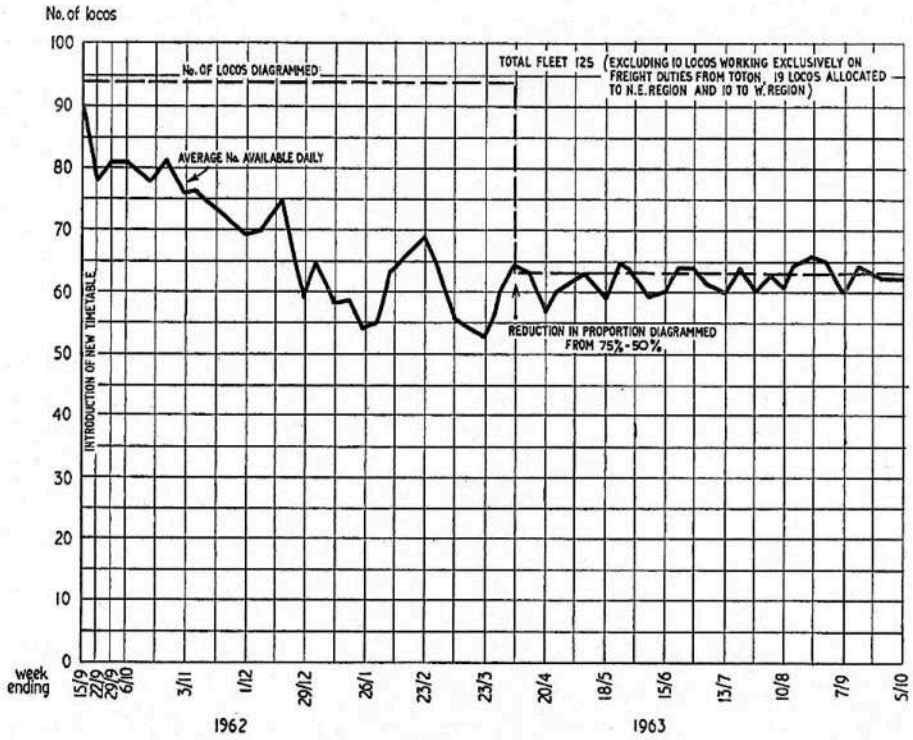
It was some three years ago that the falling off in availability began to give serious concern (Fig. 1). Research into the causes of failure was stepped up and it was not long before the list of modifications to be applied to the locomotives ran into three figures. Many of these alterations could be carried out only in main works. Nothing serious enough to warrant summary withdrawal of the whole fleet had emerged, but to deal with the units a few at a time would be a long enough task anyway. Facing this problem, the LMR took a close look at its traction control arrangements and concluded that the existing organisation for day-to-day control was perhaps a little too inflexible to ensure that the fullest possible use was made of every locomotive.

The power control at the Midland Line headquarters at Derby had been established primarily to restore unbalanced engines to their rightful owners—a necessary function in the days of steam operation, but one which failed to reflect the considerably greater degree of utilisation expected from diesel locomotives. In 1962 steam did in fact still outnumber diesel locomotives on the Midland Line. The latter comprised 136 BR/Sulzer Type 4s, all 2,500 h.p. except the original 10 in the class, which were 2,300 h.p. and confined to heavy freight workings between Toton and the Birmingham area; and some 60 or so Type 2s, mostly BRCW/Sulzers of 1,250 h.p., employed

Above left: One of the Midland Line's recently acquired Brush 2,750 h.p. Type 4 diesels, No. D1626 with brake tender on northbound coal empties at Corby. *Photo by C. T. Gifford*

Above right: A pair of BR/Sulzer Type 2 diesels, Nos. D7502 and D7505, pass Whitacre, in the West Midlands, with southbound coal on November 28, 1964. *Photo by G. T. Robinson*

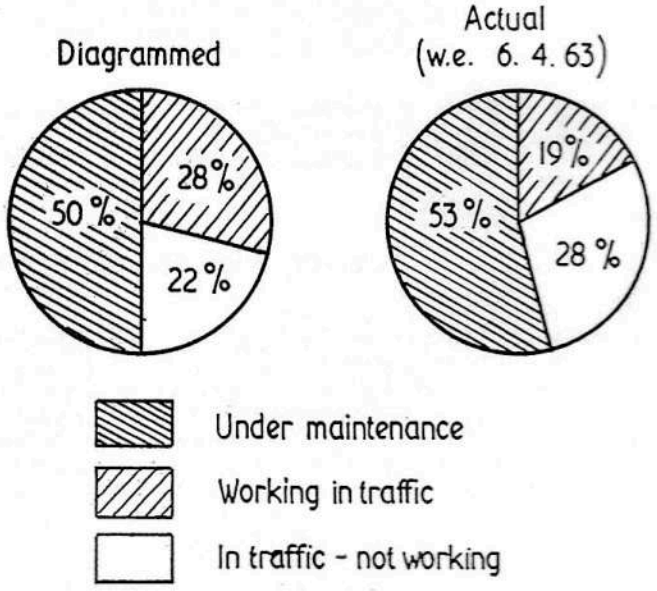
Below left: BR/Sulzer 2,500 h.p. Type 4 No. D109 passes Corby with the 14.15 St. Pancras–Bradford express, with Class 8F 2-8-0 No. 48358 at the head of an arriving coal train on the left. *Photo by C. T. Gifford*



Left: Fig. 1. Availability of Midland Line's Type 4 locomotives in 1962 and 1963.

Right: Another view at Corby, with a Class 8F 2-8-0 entering Stewarts & Lloyds Ltd. yard on a down mineral train and one of the Midland Line's Brush 2,750 h.p. Type 4 diesels, No. D1819, on an up freight. *Photo by C. T. Gifford*

Below: Fig. 2. Analysis of weekly performance. Percentages show the proportion of weekly hours in each category.



on duties in the London area.

About 20 per cent of the Type 4s were in works and it was made quite clear by the CM & EE that this was a situation which would have to be faced for some time to come. In March, 1963 the decision was therefore taken to reduce the diagrammed availability for Type 4s from 75 to 50 per cent, which acknowledged on paper what was already happening in practice. The Type 2 performance was not quite so disturbing. Although availability dropped below 60 per cent on occasions, new deliveries were still coming in and to some extent made good the deficiencies in allocated stock.

The investigation carried out by the LMR resulted in proposals for a system of controlled maintenance and for a graphical representation of diagrams. Concurrently with the reduction in scheduled availability power control arrangements were modified to permit the staff at the Line HQ to keep a closer watch on all work done by the Type 4s and to arrange for the E1 examinations (and occasionally certain others) to be carried out at any suitable depot. For a few weeks an analysis in the form of a bar chart was maintained currently in the control office, but the information recorded was insufficiently detailed to be of much practical use and the idea was dropped. The proposal for graphical diagrams was not proceeded with either.

I should explain here that although the official maintenance schedule relates to engine hours, the various examinations were arranged on an equated "days in traffic" basis, according to the following scale:

Exam. No.	Frequency	Equivalent engine hour range
E1	2–3 days	24—32
E2	weekly	60—75
E3	2 weekly	125—150
E4	monthly	250—300
E5	2 monthly	500—600
E6	6 monthly	1,500—1,800
E7	12 monthly	3,000—3,600

Some discretion was used by the controllers as to what constituted a day's work. For instance, a locomotive starting work at 22.00 after being under repair all day would be ignored in that day's reckoning. Overall, it could not be claimed that the relationship with engine hours was more than approximate.

Consultants studied diesel working

In describing the arrangements which applied from March, 1963, I have anticipated events a little. In the previous autumn the LMR decided to call in a firm of industrial consultants to make a comprehensive investigation of the whole field of main-line diesel operation. Most of their detailed studies were carried out during the spring of 1963. I can illustrate the background against which they were working by quoting some performance results typical of the period. (Fig. 2.)

Note that even the reduced target of 50 per cent availability could not be attained, but even more significantly, that less than 70 per cent of the diagrammed work was covered. As a result, diagrammed movement (generally excluding waiting time between trains) to the extent of 2,202 hours in the week had to be handled by other power—that is, Midland Line steam, or other Regions' locomotives of any description.

That the *diagrammed* figure of "in traffic not working" was so high—22 per cent—may occasion some surprise. It was due, not to poor diagramming (it could hardly be faulted in this particular case), but to a number of circumstances outside the immediate control of anyone engaged in distributing diesel power. There was a need to reflect in the diesel diagrams fuelling and inspection requirements, whether in fact every locomotive took advantage of them or not; there was a reasonable contingency allowance to cover late running (most important where a passenger turn was worked off a freight

turn); but of greater consequence than either of these was the shape of the timetable. Some calculations proved that no appreciable improvement was possible with the existing pattern of timetable, and although it was outside the strict bounds of the enquiry, the obvious deduction was made. I ought also to add that since the figures represent the weekly average, they include Sunday when locomotive utilisation was inevitably low.

A major influence during the actual week was undoubtedly the number of failures, which led to successions of broken diagrams. Late running, congestion at depots, cancelled services and special workings also upset diagrams. After March, 1963, locomotives were taken out of traffic for maintenance as required by the periodic schedule, which had little affinity with maintenance gaps in the diagrams; thus further breaks were caused. Most of the Type 4s were on cyclic workings (up to 7-day cycles): they left their diagram, on average, twice a day. The Type 2s, mostly on shorter cyclic workings, changed three times a day on average.

Contrary to what one would expect, it was not difficult to prove loss of utilisation in certain circumstances even where the diagram had been adhered to. In a world where the machines were perfectly reliable, every activity could be diagrammed; but there was evidence to show that once diagram changes were countenanced on a large scale (e.g. for maintenance purposes) the controller should be given complete freedom to make the best use of the locomotives remaining in traffic, without being restricted to pre-planned sequences.

Depot work closely analysed

The investigation included a period of analysis of depot activities. Every minute of every locomotive's life while on a depot was recorded, under the following headings:

Examinations
Repairs
Acid wash (steam-heating boiler)
Fuelling and watering
Modifications
(Waiting time in connection with these activities shown separately)
Waiting staff
Waiting material

Waiting traffic
Waiting to enter depot
Waiting to leave depot
Other activities (specified)

Each category involving staff was further broken down into man-hours—mechanical, electrical and unskilled. Among the many points which emerged were that the greater part of the fleet had too many scheduled examinations (i.e., they were over-maintained) and that half the E1 exams were done outside Midland Line territory. The Midland Line had only one diesel maintenance depot designed as such. This was at Cricklewood and at the time it dealt with all the London area Type 2s, but only a handful of the Type 4s. The majority of Type 4s were being maintained at the d.m.u. depot at Etches Park (Derby), with a little assistance from Leicester, Nottingham and Toton, which were primarily steam sheds.

Entrance to Etches Park depot was, naturally enough, through the carriage sidings. This, coupled with the layout in the shed itself—a few multi-berth roads—occasioned some inordinately long delays in moving locomotives on and off the depot (occasionally such movement took longer than the period of actual maintenance). This particular problem could not be effectively solved until the new main Midland Line diesel depot at Toton was opened at the end of last year. Even so, there were indications that something could be done to ease the position if there was a closer control of locomotives. On one day during the investigation, no fewer than 12 Type 4s were found waiting outside a depot (most of them at Etches Park) for a berth to become vacant, yet at the same time there was spare capacity at other depots. This pointed to the need for a central body to be in possession of, first, the maintenance state of every locomotive in relation to its next scheduled examination, and second, the available capacity at all depots.

The nucleus of a system already existed in the Line power control, which was recording all turns worked by the Type 4s. This work would have to be assessed in more refined terms than days in traffic. Engine hours were a convenient basis at least for the power unit, but even if the locomotives could be provided with reliable engine-hour recorders (none were, in fact, available) it would not help the controller to measure in advance what each locomotive would do—a prerequisite for maintenance planning. A great deal of research was devoted to this aspect and led to a recommendation that duty hours be used. These would be assessed from the diagram and would include:

Journey time of train
Journey time of associated empty stock working before or afterwards

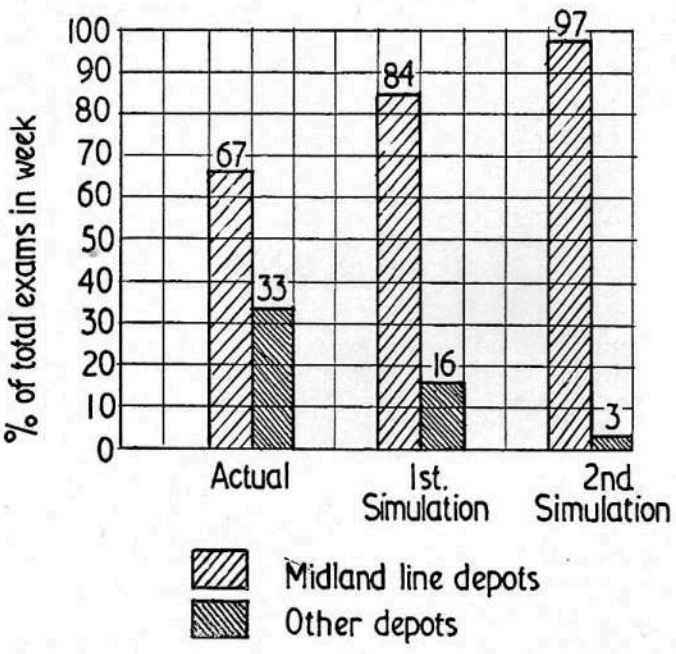


Fig. 3. Proportion of examinations carried out at Midland Line depots.

Light engine time to or from depot, station or siding
Waiting time between any of these elements provided it did not exceed 1hr (passenger) and 1½hr (freight workings)

Every train would therefore have a work content of so many duty hours, which could readily be computed in advance.

It will be gathered from this that duty hours are not necessarily the same as diagrammed hours, which might include fairly long periods of idleness between actual train working, during which the engine would not be turning over. From the controller's point of view the advantage lay in the fact that he would be able to work to the nearest hour instead of the nearest day; he could keep every locomotive in traffic until it closely approached or reached the upper limit of hours specified for the particular examination.

A joint movement and maintenance control

Thus the conception of a joint movement/maintenance control began to evolve, where one man, or one authority, would be responsible for ensuring a high degree of utilisation. He would also programme the distribution of maintenance work between depots with the twin objects of keeping the locomotives in as healthy a state as possible and seeing that capacity at the depots was not wasted. To achieve this many existing procedures would have to be discontinued and new methods adopted.

Two proposals in particular caused a good deal of controversy. First, there was the question of adherence to diagram. It could be argued that since in any event diagrams were frequently broken in order to keep the trains moving, it was not so much a volte-face of established opinion as acknowledgement of the facts of life. The criterion was a simple one: which method produced the best utilisation—not on paper, but in fact?

Second, there was the allocation of locomotives to depots. Fierce arguments raged as to the merits of tying down a specific depot to the maintenance of particular machines. As I have already mentioned, the ice was broken in March, 1965 when the controllers were allowed some liberty in this respect. The consultants now made the proposal to go the whole hog: do away with depot allocations altogether; let maintenance be done where convenient at the time it arises; and keep records at a central point. From an administrative point of view, they considered that the fleet should be split in four groups (not necessarily equal in size) and then controlled by a considerably modified Line power control, and by three new power controls set up at the three Divisions.

Many other aspects of this idea were also studied—for example, telecommunications, supply of stores, maintenance equipment, control of modifications, development of unit exchange, certain procedures in the works, and locomotive records—and the results and recommendations were circulated to the other Lines on the LMR and to the other five Regions. Although the investigation specifically covered Midland Line requirements, it was thought that some of them might be applicable to other areas.

The other Regions approached the proposals circumspectly because of differing circumstances. There was no enthusiasm for common user, non-adherence to diagram and the arrangement of examinations strictly on hours. The consultants had made some high claims of locomotive savings but one Region, at least, thought that the somewhat drastic changes mentioned could worsen performance, not improve it. The LMR was asked to prove its case.

Two simulation exercises conducted

Rather than embark straight away on reorganisation, the LMR decided to tackle this request by running a simulation exercise. This took about ten weeks in all and was operated by a small working party composed of representatives from the Midland Line, the CM & EE and the consultants. The remit, in simple terms, was to evaluate locomotive performance during a particular week of the previous April (within the period originally surveyed) and to contrast this with what would have been the result had the various proposals for improvement been carried out. In particular, the effect on availability and on the size of the fleet required was to be brought out. To cut down work, only the 126 2,500 h.p. Type 4s were to be considered.

A tremendous quantity of data had been amassed previously and it was thought that little more research into the April week would be needed. This assumption turned out to be too optimistic. A further complication arose in deciding where to make the comparisons, not so much on the availability aspect as on the size of fleet, as it was difficult to find a common starting point. During the week concerned less than 70 per cent of the traffic scheduled to diesel power was actually diesel hauled, so it was not just a question of seeing how many locomotives were required to carry out all diagrammed work.

Then there was a query as to which proposals were to be assumed to be in operation. Some were short-term, but some were long-term, spread over years. In any case no one expected a transformation overnight. There could be endless permutation of results under different sets of conditions, but a line had to be drawn somewhere. It was therefore decided to run two simulations. The first assumed that, broadly speaking, the various organisational changes had just been made and that maintenance facilities continued as they were at the time. The second assumed that the week of the simulation had fallen six months after implementation of the proposals, and that maintenance facilities were adequate.

The initial step in the exercise was to sift through all the available data, translating it into a form in which comparisons could readily be made during and after the simulations. On the movement side this involved listing the principal events which could have affected the running of trains, e.g., late running, breakdowns, mishaps, cancellations and so on.

On the maintenance side, the condition and whereabouts of every diesel locomotive at the beginning of the week had to be established. The capacity of every depot, shed and inspection point was ascertained in terms of berth space and staff, and times agreed for each standard examination and for certain repairs; these last varied from place to place according to conditions within the shed, access from running lines, etc. The existing documentation on power control was entirely unsuited to the proposed arrangements, and some new forms were therefore designed and printed for use during the exercise.

The first simulation began and the team gathered in an office on Derby station. Solemnly the events of the actual week as they affected train running and diesel maintenance were replayed minute by minute, and the "controllers" made new decisions regarding distribution of locomotives that were appropriate to the altered circumstances.

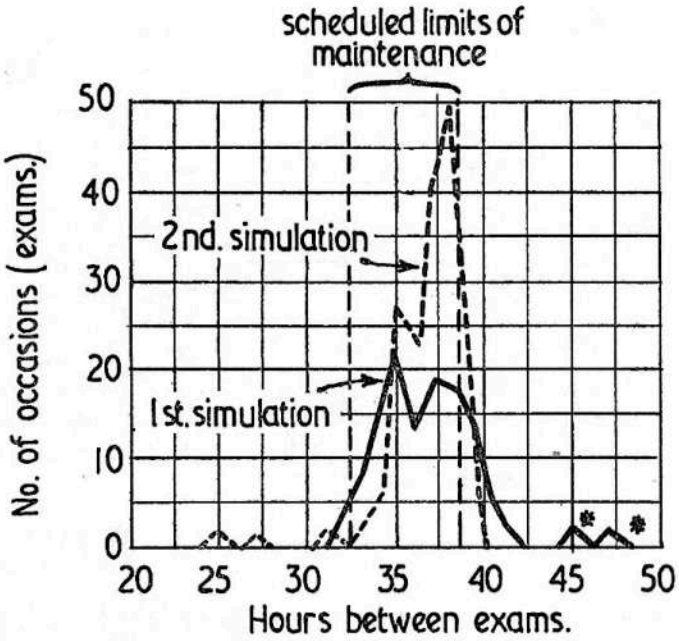
At intervals during each "day's" play statistical checks of availability and other aspects of working were taken. At the end of the "week" final readings were recorded and then the whole business began again, this time according to the conditions agreed for the second simulation. The three sets of results were put side by side for comparison, deductions made and reports drawn up. Some of the more interesting results are illustrated top right.

Wide dispersal of maintenance

The following depots and inspection points on the Midland Line which had carried out examinations and repairs on the Type 4s during the chosen week were: Etches Park (Derby); 4 Shed (Derby); Nottingham; Leicester; Toton; Cambridge Street (St. Pancras); Cricklewood East; Cricklewood West; Kentish Town; Bedford; Wellingborough; and Saltley. I referred earlier to the fact that about half the scheduled E1 (or equivalent) and a few E2 examinations were done outside the Midland Line. Just how widely dispersed the locomotives became in normal working is revealed by the list of "foreign" depots which were concerned: Holbeck (Leeds); Grimesthorpe (Sheffield); Darnall (Sheffield); Darlington; Gateshead; York; Carlisle; Trafford Park; Buxton; Polmadie (Glasgow); Corkerhill (Glasgow); Tyseley (Birmingham); Gloucester; and Bristol, Bath Road.

At the time there were diagrammed duties as far afield as Blackpool and Perth, and several workings embraced the Glasgow area, where the locomotives sometimes spent 24 or even 48hr on local fill-in duties before returning southwards. Since the Scottish Region did not undertake to carry out more than the E1 exam (24–32hr), care had to be taken to ensure that suitable locomotives were despatched on such extended diagrams.

During the simulations an endeavour was made to confine as much of the routine maintenance as possible to LMR depots. The result was highly successful. (Fig. 3.)



* Locomotives with hours above upper limit at beginning of simulation.

Fig. 4. Distribution of hours worked between examinations. It should be noted that the consultants' revised schedule, i.e. 32–38hr, was used for simulations. The average hours recorded in the first simulation were 34¼ and in the second, 36¼.

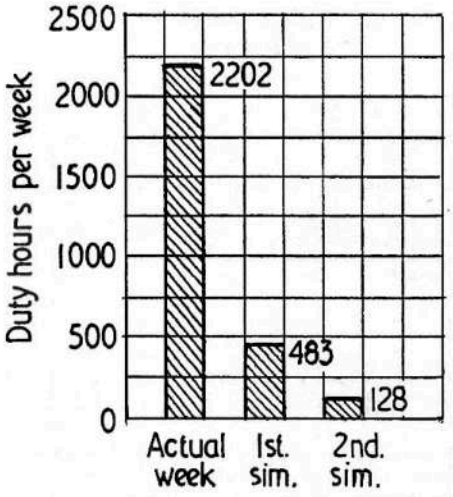
Possibly this achievement was of little more than academic interest as it could be argued with some justification that it is a sound policy to spread the smaller exams round the system—to depots lying at the natural terminating points of Midland Line services. Of much more value was the success in concentrating the range of hours within which a locomotive was withdrawn for maintenance. (Fig. 4.)

I have shown the two simulation results only as accurate information pertaining to the actual week was unobtainable. However, it is known that there were individual extreme cases of as little as 6 hr and as much as 55 hr, whereas the maximum limit between any two exams was officially 32. This first range was increased to 32–38 for the simulations, following the consultants' recommendations, and the second curve shows that very little potential was lost.

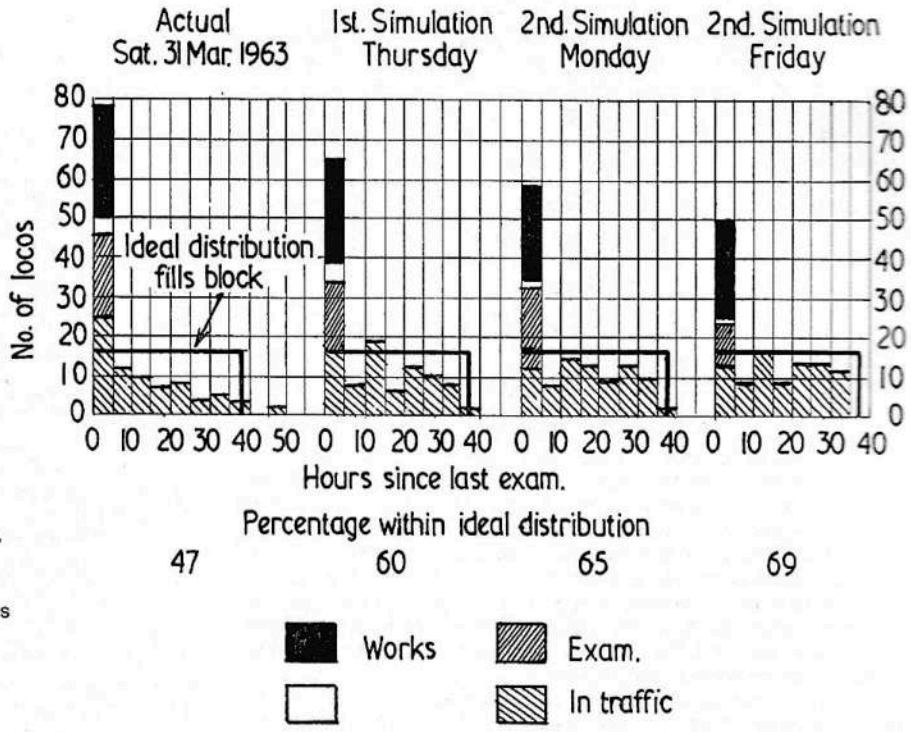
The amount of traffic diagrammed to diesels but in fact worked by "other power" has been mentioned previously. Fig. 5 illustrates how this situation was transformed. That there should be any residue of "other power" at all can be explained by last-minute failures, or breakdowns on the road, where no Midland Line replacement was available.

Flexibility in allocation of maintenance needed

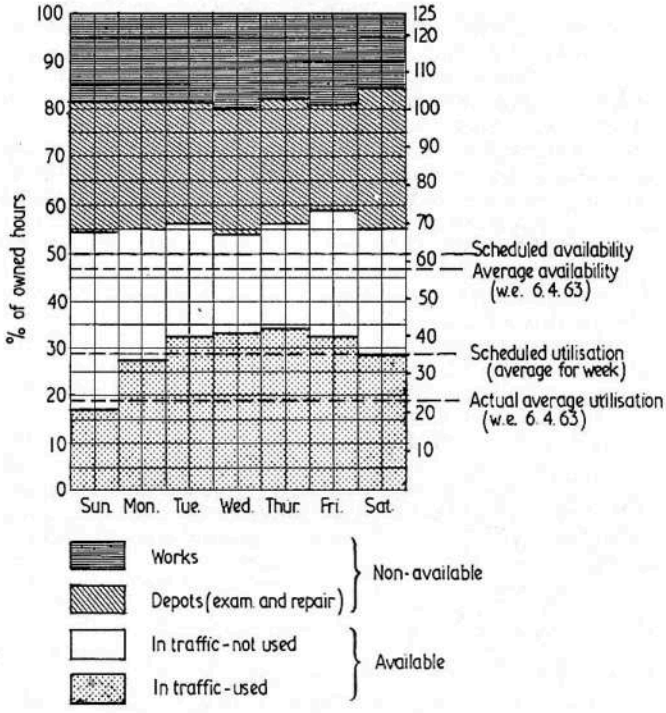
As we have seen, the length of time a locomotive was out of traffic, ostensibly for maintenance, had already occasioned some criticism. Important contributory factors were waiting berth space, waiting staff, or waiting to be moved on or off a depot. An expansion of maintenance facilities would have cured this, of course, but such a naive solution was not seriously entertained. This is not to say that working conditions and equipment at the depots were up to the required standard; they were not, nor did anyone expect them to be while diesel locomotives shared roofs with steam. A better distribution of work among the depots taking into account prevailing circumstances (e.g., a high sickness rate at one depot) could go a long way towards eliminating bunching and cutting down waiting time. Ideally there should be an even distribution of elapsed hours over the whole fleet so that the flow of work into the depots could be smooth. No matter how effectively one might programme events, locomotive failures, by imposing on the depots an additional burden (which cannot be specifically forecast and provided for), can queer the pitch. Closer control can



Above: Fig. 5. Average use of "other power".



Right: Fig. 6. Maintenance state of locomotives (hours since last examination).



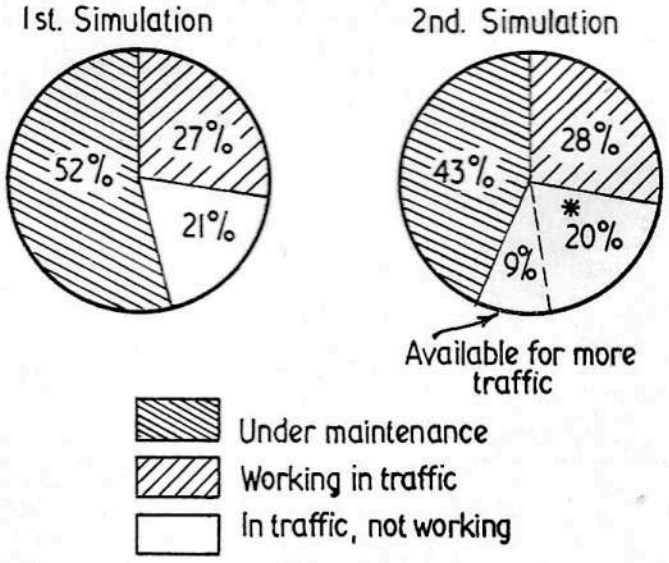
Above: Fig. 7. Analysis of performance (daily): second simulation. "Owned hours" are the total hours of allocation to Midland Line, i.e. 168 per week per locomotive.

minimise the impact of failures by diverting routine examinations. Fig. 6 illustrates what I mean.

Maintenance planning calls for knowledge not only of examination and repair facilities, but the work content of each job. Times for the standard examinations were assessed without a great deal of trouble and after the addition of certain allowances (e.g., movement on and off depot) it ought to be possible to forecast the time out of traffic for each exam. Unfortunately, things did not work out this way. In practice, almost every exam reveals the need for some repair—sometimes trivial, sometimes extensive. The relationship between the exam time and associated repair time is quite unpredictable in individual cases and the best that can be done is to settle on some sort of average. At the best of times the use of averages presents a hazard to the unwary, and especially so in this case, where the average itself varied from depot to depot and from season to season.

The locomotive performance is expressed ultimately in terms of availability and utilisation. Fig. 7 summarises the relevant information.

At the beginning of the article I included two charts showing a broad split of locomotive activities as diagrammed, and as they turned out during the actual week in April, 1963. Similar information in respect of the performance during the simulations is shown in Fig. 8.



* Estimated minimum requirement under maintenance conditions applying and pattern of current timetable

Fig. 8. Analysis of weekly performance in the two simulations. This should be compared with Fig. 2.

The simulation results were studied by the LMR management and it was accepted that the main points at issue had been proved. The Line Manager at Derby was asked to prepare a scheme to implement the proposals, not necessarily as they stood, but in essence. Much thought was given to the mechanics of the control system, since it was one thing to produce results on paper and another to translate it into practice. Above all, the scheme had to be simple and direct.

Before any move could be made, some improvements in communications were essential, and these were put in hand immediately in anticipation of the Line Manager's acceptance of the report. It was in due course accepted and, although it was tailored to suit Midland line requirements, once again the other Lines and Regions were given the opportunity of studying it. Interest was expressed, but little more, so the LMR had to proceed with the scheme alone. It was decided that the Midland Line would change over to the new arrangements on January 11, 1965, that the Western Line would concurrently adopt as many of the proposals as it could and that the North Western Line would consider similar arrangements when it had sufficient diesel locomotives to make this worthwhile.

(To be concluded)

SIGNALLING NON-STANDARDISATION

Concluded from page 303

Chief Signal Engineer dictates general policy, the free hand given to Regional signal engineers, in particular in the design and supply of components—one example is the ER's adoption of single-lens searchlight signals, contrary to practice elsewhere —must influence costs. Simplicity in track layouts will do much to bring signalling costs to a level acceptable for secondary trunk route modernisation; much more could be saved by mass production if new signalling components were standardised throughout BR.

THE COST OF ELECTRIC POWER SUPPLIES TO EUROPEAN RAILWAYS

ARE British Railways getting a fair deal from the Central Electricity Generating Board? The circumstances and conditions under which electric power is supplied to other Western European railways differ, but in general they appear more encouraging to the spread of electrification. Where power supply is nationalised, the practice seems generally to be to supply the nationalised railways with current at rates favourable enough to keep the working costs of electric traction down, at least sufficiently not to prejudice extension of electric traction and certainly enough to ensure its continuance.

In the rare cases on the Continent where an electrically-worked line is closed, it is usually because traffic no longer justifies a railway, not because electric traction *per se* is too costly. It is true that certain branch lines in Italy are being de-electrified in favour of diesel traction, but the reason is time-expiry of three-phase equipment up to 40 years old; the choice has therefore been between re-equipment for 3,000V working and dieselisation. There is no question of abandoning electric traction because current is too dear.

By and large, where the electricity supply and the railways are both nationalised, the rates paid by the railways for current are relatively moderate compared with interest on the capital cost of electrification and other charges incidental to electric working. In those countries, moreover, the railways tend to be relatively more important as consumers than is BR to the Central Electricity Generating Board. The increase in electricity consumption in Great Britain has accentuated this position. Some other countries, of course, can increase their supplies by means of hydro-electric projects which take less time to execute than do the classic British coal-fired power stations of the 1960s, which are being erected in haste to meet rapidly increasing demands.

In Switzerland power supply is not nationalised. The Swiss Federal Railways obtain current for their lines, which are electrified at 15,000V a.c., 16⅔ cycles, from three categories of plants: SBB plants, all hydro-electric; plants owned jointly by SBB and large electricity supply undertakings, also hydro-electric; and privately-owned plants. Current from the six SBB plants is used exclusively for traction. The staff is SBB and the plants function as integral parts of the railway undertaking. All expenditure on operation, maintenance, amortisation, etc., are on SBB account. In the three jointly-owned plants, the SBB is a partner of large supply undertakings. The SBB quota of the supply is fixed in proportion to the SBB investment, as is the SBB share of operating expenses. The SBB and its partners each have their own group of generators, etc. Those belonging to the SBB produce single-phase current at 16⅔ cycles, whilst the public supply is three-phase, 50 cycles.

As regards privately-owned plants, the SBB has concluded long-term contracts with a number of undertakings. The contracts specify the output due to the SBB. The basis of tariffs is a combination of a basic rate, irrespective of the amount actually consumed, and of the price in centimes for each kWhr. The charges so obtained are called "working prices" and differ as between summer and winter when output and consumption differ considerably. In some instances, however, they are based on maximum and minimum tariffs. The single-phase supply from private undertakings is either generated in hydro-electric power stations or converted in special plants to three-phase, 50 cycles.

The average price of SBB traction current, in pence per kWhr, has been: 1960, 0.745; 1961, 0.646; 1962, 0.74; 1963, 0.932; 1964, 0.945. (The present CEGB price to BR is understood to be 1.206d per kWhr.)

The reasons for the fluctuations are, in the case of the SBB and jointly-owned power stations, variations in the rainfall and snowfall on which the hydro-electric plants depend, and also rises in the prices charged by privately-owned plants. There have been great increases in the construction costs of new plants, reflected in higher interest charges passed on to electricity consumers.

In Western Germany electricity supply is not nationalised. It is in the hands of a large number of independent undertakings, which serve areas of varying sizes. The Federal Railway, however, has its own H.T. grid, which enables it to buy current from the undertakings that offer the most favourable terms. This may involve refusal to sign or renew a contract with a supply undertaking which serves an area through which the DB grid passes. In general, the DB defrays the cost of constructing the plant necessary to supply the railway and in many cases itself supplies the fuel (coal or brown coal) for the generating plant. In addition it pays the recurrent charges which relate neither to the capital cost of the plant nor to the supply of fuel, but these are relatively small. Increases in the price of fuel may add to the cost of current, but they have only a limited effect on the cost of electric as compared with other forms of traction.

Some 60 per cent of the French Railways' 15,000V a.c. and 1,500V d.c. traction current is derived from the nationalised undertaking Electricité de France. The supply, indirectly, of the remainder from 22 railway-owned hydro-electric power stations, nearly all in the Pyrenees, is largely a relic of the earlier electrification ventures of the Chemin de Fer du Midi. The combined output of the SNCF plants is 520,000kW, and they stepped up production to a total of 1,680m kWhr in 1963. The basis for EDF charges to the SNCF for traction current is as follows: France is divided into two zones. The first, which includes all the railway-owned power stations, is south of a Granville–Paris–Vierzon–Saincaize–Clermont Ferrand–Nîmes line. In this zone the SNCF sells all its own plants' output to EDF, which in return supplies to the SNCF all the current it requires. All prices take into account transmission of a proportion of current in this zone by SNCF power lines. North of the Granville–Nîmes demarcation line, there are no railway-owned generating plants, but the SNCF's consumption of traction current is greater. In this zone all current is supplied by EDF at the same rates as to other industrial consumers of H.T. current, in accordance with the *tarif vert* ("green tariff"); this is a complex compilation designed *inter alia* to ensure utilisation of power in the best national economic interests, which covers supplies at rates which are remunerative to EDF, but which also favour the railways and other large consumers. There are too many differentials in this tariff to enable a meaningful rate per kWhr to be quoted. The charges are stated by the SNCF to be reasonable.

First-class for second-class fare in North Kent

First-class compartments in certain SR business trains via the North Kent line will be open to second-class passengers from June 14. This, says the SR, is a move to relieve overcrowding; the SR will make refunds to passengers still holding first-class season tickets who use these trains after June 14.

TRAFFIC DIVISIONS OF BRITISH RAILWAYS — 4

Bristol

PART TWO

Scope to develop new traffic is limited in a Division that is largely a receiving area for goods and short of heavy industry. But new methods have made gains in agricultural feeding stuffs, chemicals, ice-cream and stone. An operational innovation is a new approach to traffic control that cuts down reporting

G. Freeman Allen

NEWS that the WR is this summer screwing a few more minutes out of its main-line schedules may have cocked eyebrows, recollecting last winter's reports of sporadic WR diesel traction troubles. Mr. W. N. Griffiths, the Division's Maintenance Engineer, stressed to me that his chief worries were not only the basic capability or reliability of his locomotives. The main concern was the persistent difficulty, not merely of retaining craftsmen for traction maintenance, but even of recruiting sufficient men to keep staff up to requisite strength. On the record at present, Bristol Bath Road looks like being as many as 30 technicians under strength when it has acquired its ultimate allocation of 125 main-line diesel locomotives. Mr. Griffiths' problem is the drearily familiar one of several BR traction maintenance depots in areas where there is also a substantial engineering industry and a sellers' market for skilled labour. In Bristol the most powerful competitor so far has been the aircraft industry, but there are also engineering and motor firms desperately bidding for electricians and fitters with pay and regular hours that BR cannot match.

Also disconcerting the Division and inevitably affecting both the availability and reliability of its diesel traction is the slow rate at which scheduled modifications of the original designs are being carried out. Wherever practicable, these modifications are being executed at Bath Road depot, but the majority of the alterations demand equipment that is only available at main works. For example, on one type, of the 25 modifications prescribed for the train-heating boiler, only two are remotely capable of being done on the depot.

The steam allocation of the Division is now down to little more than 100 locomotives, shared between only three depots—Bristol, Worcester and Gloucester. Last year alone seven steam running sheds were shut down and three more were reduced to signing-on-and-off points. Major steps in this contraction of steam working were the concentration of the remaining locomotives at Bristol and Gloucester on one depot in each city. Steam working should finish entirely this year at Gloucester and Worcester (where one of the sheds is to be converted into a diesel servicing depot), but whether finality can be reached at Bristol Barrow Road before the year is out hinges on the punctual delivery of new diesel locomotives.

Bristol control to adopt new practice

When the WR established its present Divisional structure at the end of 1962, Gloucester was one of three Districts to remain separate managerial units for day-to-day supervision of business. It lasted that way for only two years, however, and since the end of 1964 the only department left at Gloucester has been the traffic control office. This, too, is to be absorbed in the Bristol headquarters in the near future.

In combining the functions of the Bristol and Gloucester control offices, the Division will abandon the traditional Western practice of separating passenger and freight traffic supervision. Each Section Controller will be responsible for all movement in his territory and reporting points will be standardised for both passenger and freight trains. Reporting points will be reduced in number and each controller will oversee a wider area. Thus one man and an assistant will supervise the ex-Midland main line throughout from Bristol to Barnt Green, on the outskirts of Birmingham; another will be in charge from Chepstow to Stratford-on-Avon; a third will cover from Severn Tunnel West to Westbury (exclusive); a fourth's writ will run from Swindon to Standish Junction; a fifth will control the Bristol area south-westward to Bridgwater; and the Worcester area will come under a sixth controller. A single traction controller will supersede two engine controllers and the relief controller will be re-designed staff utilisation controller, to symbolise the contemporary attitude.

A significant feature of the new arrangements will be a fairly drastic reduction in the amount of reporting to control. All traffic will be reported when it enters the Division, but once within the boundary signalmen at reporting points will only advise control when trains are running late. The Division has an eye to the end of the decade when probably the only reporting points in its territory will be the four power boxes. "You can't expect a signalman in one of those boxes to be continually reporting track circuit operation," as one of the Division's officers put it to me. Even now, signalmen are often frustrated because the wires to control get clogged with routine reporting calls and a man who needs guidance urgently has a job to get a word in. Moreover, the controllers themselves are apt to get so bored with repetitive routine that their flair for improvisation may be dulled when the crunch comes.

New freight traffic hard to find

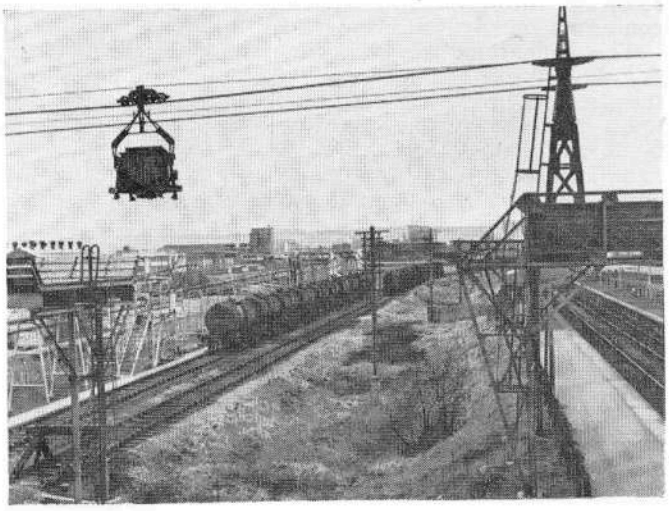
The Bristol Division's heaviest single flow of freight traffic brings it no revenue. But because of its importance it is one of the primary concerns of the Division's Movements Manager, Mr. J. Palette. This is the flow between the North and South Wales, of which the steel component has increased substantially since mid-1964 following the developments of diesel-hauled block trains with specialised vehicles that have begun to recapture business from road haulage. The volume is now about 70 trains a day inward and eight or so fewer outward; the imbalance arises because of the coal that flows into the South-West, whereas on the South Wales route incoming heavy steel is counterweighted by outgoing tinplate. As I described in the April issue, this flow is being fully dieselised. With the dieselisation of the Oxford–Worcester line by the start of the summer and of freight services to Oxley and Stourbridge, and from South Wales to Swanbourne (on the Oxford–Cambridge line) via Swindon in the ensuing months, the Bristol Division will be rid of scheduled steam working on all its main-line passenger and freight services by the end of 1965.

The Bristol Division's quest for new originating freight traffic is hampered by the area's lack of heavy industry. Its biggest potential source of traffic is the Port of Bristol, where the business is largely import. With the aid of the

BRB's Market Research Officers, a comprehensive study of the port's business is in progress to determine the traffics for which the railway should bid boldly if they can be handled economically by modern bulk methods. To date sales efforts have met severe difficulties on the score of rate. Prices must be especially keen in this area, which has a big surplus of road transport. Its consumer goods industries are the focal point in particular of lorries seeking return loads to the Midlands after carrying goods to South Wales.

Block agricultural feeding-stuff trains

Agricultural feeding-stuffs offer scope for a considerable increase of originating business. Here there is a great deal of lost ground to be recovered. To avoid the excessively high cartage costs of a "fire brigade" distribution service on demand to local merchants and farmers, BR recently faced the trade with a Hobson's choice of concentration or adopting other means of transport. Too many customers elected to do the other thing—to the extent, in fact, that the Bristol Division lost about 40 per cent of its annual revenue from this traffic last year. However, the rot was stopped and restoration of the position begun by a thoroughly planned effort. An economic survey covering all the suppliers in the Division and their consignees—dispersed over a wide tract of the country bounded by West Wales, the West Midlands and the Isle of Wight—was conducted to arrive at a block loading plan that would combine economical working for the railway with attractive



Above: The rail-served loading installation of the ICI chemical plant at Severnside, from which an increasing amount of block tank wagon trains are despatched.

Below: A Class 9F 2-10-0 passes Stoke Gifford yard with empty ICI chemical tanks returning from Immingham to the Severnside plant. *Photo by C. T. Gifford*

"Western" Class 2,700 h.p. Type 4 diesel-hydraulic No. D1071 *Western Renown* heads a freight for Avonmouth past Filton Junction. In the background is the embankment of the main line from Bristol to Badminton. *Photo by C. T. Gifford*

rates and the best possible service, given the necessity of concentration, for the consumer.

The initial outcome was the running for British Oil & Cake Mills of one block train a week to Cornwall. Since then, several firms have been attracted to the concept and today more such trains run weekly to Cornwall and to South and West Wales. All supplies of one large firm to some areas—Penzance, Swansea and Newport, for example —are now railborne. A more recent development for this traffic is a modified version of the standard plate wagon, agreed with British Oil & Cake Mills, to carry 20-ton palletised loads of feeding stuffs. The Division has high hopes of this innovation. Certainly the potential traffic on offer is worth investment; about 60 per cent of it is presently moved by C Licence road transport.

Another important source of block train traffic is the ICI Severnside works, which is not yet at its full planned output. Its products are ethylene glycol, fertilisers, liquefied ammonia and other chemicals. At present it generates a daily block train, running three days a week to Immingham and on the others to destinations in the NER, though the train path is the same in each case as far as Doncaster, to which one of the WR's Brush Type 4 diesels works through. In addition, there is a thrice-weekly block train of liquefied ammonia to Fisons at Stanford-le-Hope, on the LTS line in Essex, which should shortly be running daily. Apart from the prospect of increased traffic as the existing plant's output rises, new developments recently announced for Severnside promise further rail traffic.

At present the Division's business in motor-car bodies is relatively small, but hope is seen of substantially expanding traffic from the Pressed Steel plant at Swindon, which is well equipped with private sidings that are under-utilised. Apparently the intensive movement of road transporters by night between Swindon and Oxford rouses a growing volume of public complaint that is beginning to concern the firms involved.

Mickleover containers for Walls?

A particularly interesting freight development in the Division is the probable adoption by T. W. Wall & Sons of the 25¾ft-long, 12-ton moulded plastic container by Mickleover for frozen foods and ice-cream, which was described on page 325 of the November 1964 MODERN RAILWAYS. A prototype was one of last year's London Liner train display exhibits. Walls are centralising ice-cream production on their Gloucester factory, which hitherto has generated a negligible amount of rail traffic and is not rail-connected, so that achievement of a deal with them will be another proof of BR's new competitive ability with modern high-capacity equipment—in this instance, against C Licence road transport. The traffic, naturally, will be markedly peaked in the summer, hence tight control of the equipment will be essential if serious over-provision of capacity in relation to the year-round load is to be avoided, particularly as the containers will range as far afield as Edinburgh and Glasgow.

Aside from its historic port, tobacco is the obvious association of Bristol; and it provides one of the largest volumes of any merchandise traffic in the Division. Of late, however, it has meant some headaches for the Sales & Marketing Organisation. First, the tobacco firms have had to be persuaded to accept a higher degree of concentration; and second, BR have been little less immune from hijacking and pilfering of these goods in transit than road haulage, though the road sufferers have had more publicity.

Trainload traffic in limestone

Like the Stoke Division of the LMR, surveyed in the preceding article of this series, the Bristol Division sees opportunities for a considerable expansion of building constructional material traffic in block trainloads. Negotiations are reaching completion for the sale to one quarrying firm of the disused Flax Bourton station, south-west of Bristol on the Taunton line, which would be converted into a depot for the receipt of aggregates and the despatch of limestone in 500–1,000-ton trainloads largely to the London area, but to other centres of constructional activity as well. The firm proposes a mechanised reception plant at West Ealing from which the materials would be road-distributed in South and West London. It also contemplates a concrete-mixing depot at Bridgwater, from which the product would be distributed by rail. Another quarrying development may lead to two weekly trainloads of stone to the London area from a private siding on the Cheddar Valley line.

Originating revenue naturally preoccupies the Divisional Sales force. Under the Marketing and Sales Manager there is a Sales Superintendent at both Bristol and Gloucester, each with two general representatives but with two passenger representatives at Bristol and one at Gloucester. Of the five specialist representatives, four are obviously concerned in large measure with traffic generated in the Division. They cover: grain and agricultural feeding-stuffs; docks; tobacco, confectionery and paper; and agricultural machinery. But the fifth, whose charge is civil engineering, has been particularly concerned to see that as much as possible of the materials for construction projects in the South-West is railborne. For example, he spent a considerable period in the NER helping to plan the transport of steelwork for the Severn Bridge, all of which was moved by BR, from a depot at Thornaby. Similar attention is being paid to the intake of material for the M4 and M5 motorways.

Computer aids management

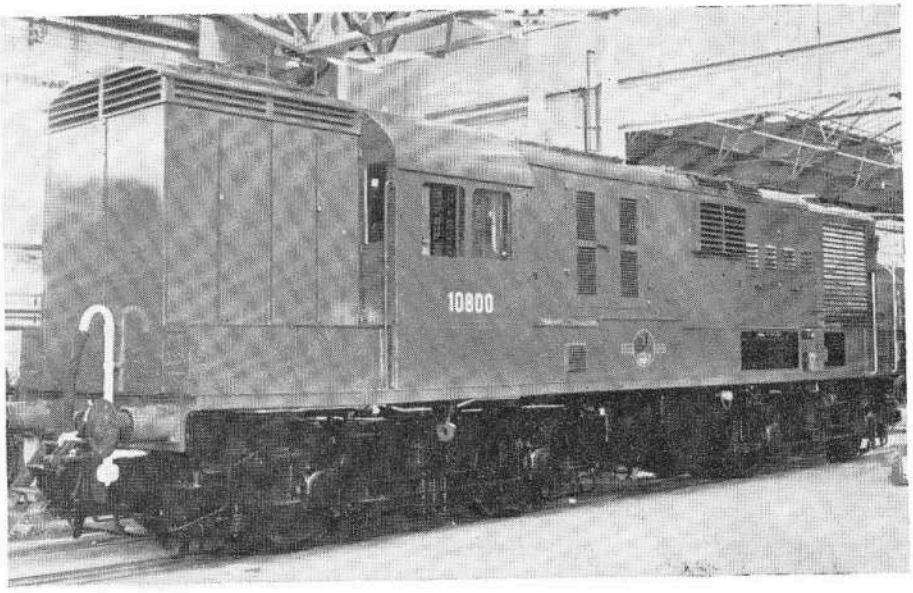
On the WR, accountancy has been largely decentralised to the Divisions. Each Division except Plymouth has had a computer for some time, but until last year, when they were replaced, those at Bristol and London were decidedly obsolescent. The new equipment at Bristol is unique among present BR apparatus of this kind for its rapid printing rate, which is being fully exploited. Originally used only for the production of paybills, the computer is now employed up to 50hr a week on a variety of tasks, from producing customer accounts in a much shorter time to generating a wide range of financial data for the guidance of management, both at the Divisional headquarters and among the local units in the field. Each department of the Division is furnished with a weekly account of its financial performance in relation to budget that incorporates a wealth of detail and ensures that every manager, in every stratum of management, is constantly aware both of the costs he is incurring and the results he is getting for them. The Movements Manager, for example, knows just what additional expense he will run up if he lets a backlog of goods involve him in Sunday working of a depot.

A new layer of management is developing in the Bristol as in other Divisions with the appointment of Area and Station Managers, of whom there will be 14 by the end of 1965 and ultimately perhaps 27 in all. Unlike at least one other Region, the WR is not imposing on its Division a rigid pattern for such appointments. In the case of the larger traffic centres, a Division has the licence to decide how many managers will most efficiently meet the peculiar requirements of each locality. Thus the appointments to Swindon, for example, may not conform in title or scope to those found desirable at Gloucester or Worcester.

Balancing books will be difficult

The prospective merger of the Bristol and Plymouth Divisions is bound to prune more of the administrative costs of running a railway in the South-West. The consequences may be harsh for some railwaymen, but it is the only logical course, given an obligation to try and run a viable service in this part of the country. The whole of the South-West is essentially a receiving area for goods. As our articles have shown, there is little or no heavy industry to generate the railway's staple traffics and the scope for development of fresh revenue is very limited. A high proportion of the Division's movement and terminal expenses, therefore, is incurred by traffic for which the originating revenue is credited to other units of the BR network. Consequently the Bristol team has no enviable job in trying to balance its books on a Divisional basis. One's respect for its acceptance of the challenge is coloured only by doubt that, in a territory with these characteristics, the challenge is socially or economically a sensible one.

The Brush "Hawk"



A major advance in electric transmission for rail traction—elimination of the commutator—has been brought nearer by the development work of Brush Electrical Engineering Co Ltd in collaboration with BR. It has been embodied in the "Hawk" diesel-electric research locomotive with a.c. transmission.

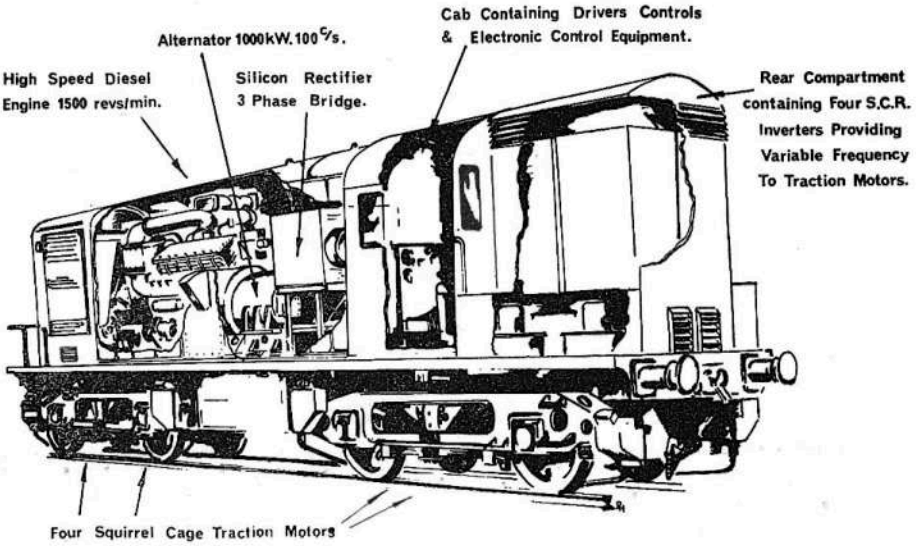
E. L. CORNWELL

AS already announced in the March issue of MODERN RAILWAYS, Brush Electrical Engineering Co, Ltd, in conjunction with British Railways, has installed in an obsolete Type 1 BR locomotive a 1,400 h.p. diesel engine and an a.c. transmission system. The Brush designation is SCAFI (semi-conductor adjustable frequency inverter) and the locomotive is named *Hawk*. The diesel engine drives a brushless alternator, the three-phase a.c. current from which is rectified by silicon diodes to provide variable-voltage d.c. The d.c. current is changed into variable-frequency a.c. by inverters comprised of silicon-controlled rectifiers (thyristors) and fed to three-phase a.c. squirrel-cage traction motors.

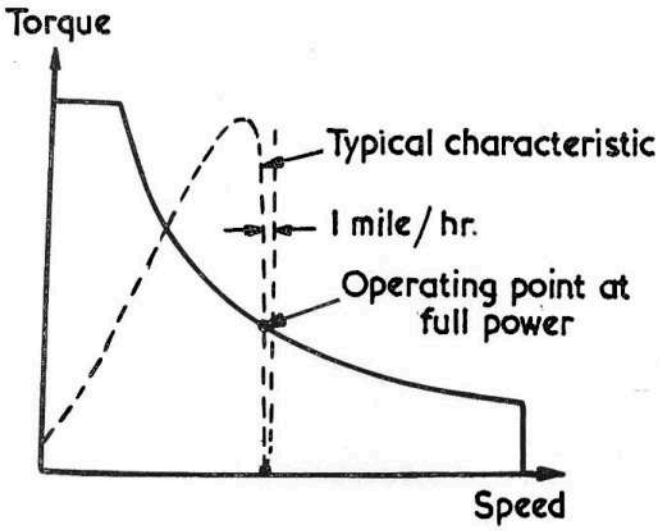
The *Hawk* locomotive is at present undergoing commissioning tests at Rugby and is expected to be ready for trial running on BR later this year. It must be emphasised that the *Hawk* is a research project and that much work remains to be done to develop it into a fully operational locomotive. Nevertheless it represents a major technical advance that is certainly up with and probably ahead of anything so far achieved elsewhere.

The use of solid-state rectifiers to provide d.c. traction current from a.c. supply is now, of course, accepted practice in straight electric traction and is likely to become so eventually in diesel-electric locomotives. Nothing fundamentally new is claimed for that part of the *Hawk*, though it is the first British diesel locomotive application and will provide valuable operational experience with a type of equipment that might be essential in the higher-power locomotives now being considered. Even though the alternator might initially be used to power d.c. traction motors, it is a worthwhile development to gain the inherently more suitable traction current supply from an alternator, compared with a d.c. generator.

The major advance in the *Hawk* is the development of reliable controllable inverters of sufficiently high power for traction purposes and of a complete a.c. system having an overall efficiency equal to that of conventional d.c. transmission. The principle is, of course, applicable to both electric and diesel-electric traction. It represents a classic piece of applied research which, despite quite emphatic opinion in some quarters that the state of static-device art is not yet ready to deal with such high powers, and early disappointment with some variable-frequency inverters of much lower power, has been pressed through to a stage at which the general principle may be said


Cab Containing Drivers Controls & Electronic Control Equipment.
Alternator 1000kW. 100 c/s.
High Speed Diesel Engine 1500 revs/min.
Silicon Rectifier 3 Phase Bridge.
Rear Compartment containing Four S.C.R. Inverters Providing Variable Frequency To Traction Motors.
Four Squirrel Cage Traction Motors

A diagram illustrating the main components of the Brush "Hawk". Although a 1,400 h.p. diesel engine has been used in the present research, Brush anticipate that a.c. transmission will come into its own at higher powers, especially with engines of over 3,000 h.p., where d.c. machinery is nearing its limits. The system is equally applicable to electric traction from a d.c. supply by using a thyristor chopper for d.c. voltage control, and from a 25kV single-phase supply by using a tap changer or thyristor control.



Above: Fig. 1. Typical steep torque-speed characteristic of a squirrel-cage motor.

to have been proved in the laboratory. It remains to prove it in operation and to develop a control system capable of exploiting its undoubted potential advantages.

The principal advantages

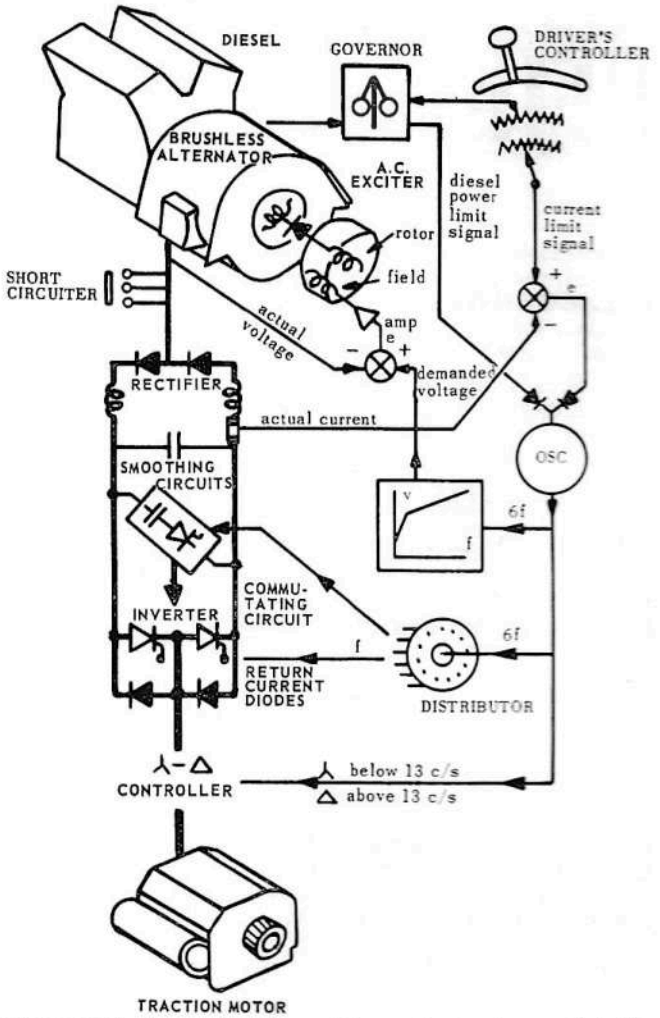
What those advantages are is generally acknowledged. Principally they result from freedom from the limitations of commutation, but they include also the ability more conveniently to devise a continuously variable torque conversion and freedom from the fixed steps of notch control. On the generator side, even run at like speed, an alternator-rectifier, and the necessary additional engine-starting device, can be smaller and lighter than a d.c. generator of comparable output; geared to run at higher speed it can be considerably smaller and lighter. Its present higher first cost is already offset or partly offset by a lower maintenance requirement and would probably be removed or reversed with higher levels of production. Much the same characteristics apply to a.c. traction motors, with the added advantages of higher overload capacity and freedom from temperature and moisture troubles.

Understandably, it is the electronic bits in the middle that are most likely to worry railwaymen, who will see in them greater complication than in the familiar d.c. control gear and higher failure potential. Yet it is surprising how much electronic equipment has already been accepted in railway engineering. Apart from solid-state rectifiers in traction and various other functions, the Brush company has developed various pieces of electronic and semi-conductor equipment for railway service.

Electronic development by Brush

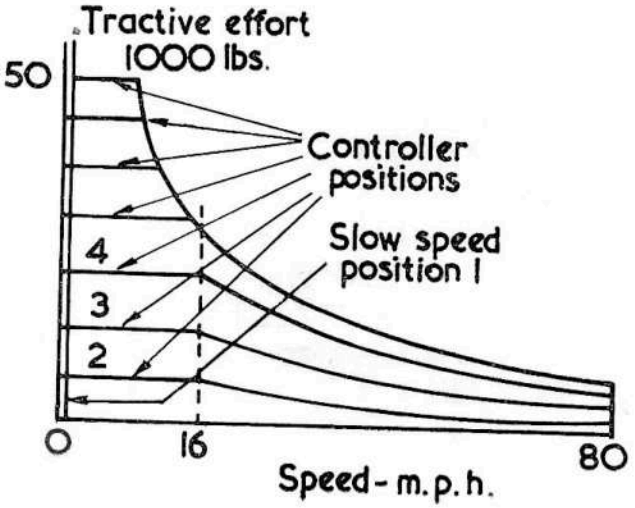
For example, in 1962 a magnetic amplifier wheel slip detection system was fitted to a Type 2 locomotive and then, after successful trials, to many BR Type 4 locomotives and to 14 locomotives supplied to Rhodesia Railways. The system compares the voltage across two traction motors in series in a series-parallel arrangement; it is said to be highly sensitive, reliable and successful.

At about the same time the company developed a field strengthening system operated by measurement of the main generator interpole volts. This was followed by a field divert system developed jointly by BR and Hawker Siddeley Dynamics that was based on locomotive speed. This system works in conjunction with an electronic speed indicating equipment, also developed by Brush and H.S.D.



Right: Fig. 2. Circuitry of the a.c. transmission system in the "Hawk", shown with the proposed full electronic control system now in development.

Below: Fig. 3. Tractive effort-speed characteristics provided by the proposed control scheme.



The electronic speed indicating equipment was introduced to give accurate indication of speed down to less than 0.5 m.p.h., a requirement for merry-go-round operation. Following the introduction of an accurate speed indicating equipment it was then used to activate the field divert system according to speed. The resultant electronic unit eliminated several auxiliary relays and nearly 50 associated auxiliary contacts, also providing increased reliability and reduction in maintenance.

Originally the control for the merry-go-round trains (or "Slow Speed Control" as Brush prefer to call it) was manual; the speed indication alone was by electronics. However, again based on the electronic speed indicating unit, an automatic speed control system is to be introduced this year. On this system the driver simply selects the required speed (up to 3 m.p.h.). The electronic control system compares the actual locomotive speed with the required speed set by the driver and adjusts the generator

field accordingly. Preliminary trials have shown that the speed can be controlled to within better than 0.1 m.p.h.

In order to study the performance and reliability in traction service of such static devices as transistors and thyristors, in 1962 Brush fitted a 400 watt inverter to a locomotive. The inverter had a 110V d.c. input and an output of 300V a.c. at 400 c.p.s. Driving a dummy load, the equipment is still running without failure and is said to be able to withstand full-load switching on and short circuit without damage to itself or any associated equipment. A patented device for simplifying the use of thyristors on 110V d.c. circuits was fitted by the company to a locomotive in 1963. The device changes the d.c. current to a type of chopped wave form with a negative pulse every 20 milliseconds; output of the interrupter was 120A. It has since been adapted as the basis for a static load regulator, which is about to go into service on a Type 4 locomotive, to control 30A on the main generator field.

Current Brush plans form an ambitious programme aimed at replacing as many moving parts in the control system as possible by static equipment; they include the use of alternators instead of conventional d.c. generators and of a.c. auxiliaries to avoid commutator maintenance. Hawker Siddeley Dynamics is co-operating fully in the programme, providing a valuable backing of aircraft industry experience and resources. It is out of this broad background of experience that the *Hawk* research locomotive has been developed. Of the *Hawk* inverters specifically, the company says that its laboratory tests have indicated that the replacement of the usual mechanical switches by semiconductor switches greatly increases reliability.

The arrangement of the "Hawk"

The *Hawk* locomotive is No.10800, built for BR in 1950 by the North British Locomotive Co Ltd. The original Paxman engine has been replaced by a Bristol Siddeley-Maybach diesel engine rated at 1,400 h.p. at 1,500 r.p.m. It is directly coupled to a Brush 950kW 8-pole three-phase alternator having a maximum voltage between lines of 1,325V and a frequency proportional to speed, rising to 100 c.p.s. at 1,500 r.p.m. Both the alternator and the exciter are of single field design, providing a completely brushless set, having volt/amp characteristics comparable to the Brush three-field d.c. generator. In the research locomotive a shaft-driven 110V dynostarter provides power for auxiliaries and engine starting.

Rectification of the alternator output is by a Westinghouse 900-0-900V 600A silicon diode bridge of simple construction and proved reliability, and rectifier protection is provided by a high-speed alternator short-circuit switch. A smoothing circuit reduces ripple, stabilises the d.c. voltage and also provides energy storage for the inverters, which are force-commutated using static capacitors and commutating thyristors. The inverters themselves, one serving each traction motor, each comprise 36 thyristors rated at 150A 500V in six banks to form a three-phase thyristor bridge. A further 16 thyristors in two banks of eight perform the forced commutations and silicon diodes in a three-phase bridge configuration carry the return currents from the traction motors after each commutation.

Switching on the thyristors is accomplished in the normal way by applying d.c. pulses in turn to the thyristor gates. Switching off a thyristor carrying a heavy current is a much more difficult problem and its solution by Brush represents the greatest achievement in the *Hawk* locomotive. To switch off, either the current must be reduced to zero momentarily or a pulse of reverse polarity must be applied to the thyristor. The Brush method uses the commutating capacitors into which current is bypassed, to force a reverse voltage across the inverter thyristors.

The Brush inverter is rated at 900V 400A and produces a three-phase supply of approximately square wave form variable from 0.5 to 100 c.p.s. Because thyristors are expensive at present, their number has been reduced from what would otherwise be required to cope with the very high current difference between high and low speeds by introduction of a star-delta switch in the traction motor supply. The switch is arranged for star connection up to 13 c.p.s. and delta connection above that frequency. The Brush squirrel-cage four-pole traction motors are rated at 225 h.p. and have a maximum torque of 5,000lb/ft and a maximum speed of 3,000 r.p.m. Maximum locomotive performance is 50,000lb tractive effort and 75 m.p.h.

Having reached the position of providing adjustable-frequency current, and thus the ability continuously to adjust the torque output of the traction motor according to demand, full advantage can be taken of the typical steep torque-speed curve of the induction motor illustrated in Fig. 1. It will be seen that the speed difference between non-slip and slip at the wheels is only 1 m.p.h., which in practice means that the tractive effort contributed by slipping wheels is almost as high as with full adhesion. It could be anticipated that an a.c.-motored locomotive would outpull any d.c.-motored locomotive of comparable power, with an advantage in round terms of perhaps 10 per cent.

Notchless control system proposed

Control of the *Hawk* locomotive, including the star-delta switch, is through a conventional pneumatic controller, but as operational experience progresses the Brush company sees a notchless control system developing. The driver's controller could simultaneously adjust the engine speed-power setting and traction motor current. The current controller is designed to provide effective control of tractive effort by controlling inverter frequency, which taken in conjunction with the nearly vertical torque-speed characteristic of a slipping wheel, as shown in Fig. 3, will produce the ultimate in adhesive properties. Also in the control scheme a reference signal representing the correct voltage for every frequency is produced and used to adjust the alternator exciter field current through established closed-loop voltage-regulation techniques.

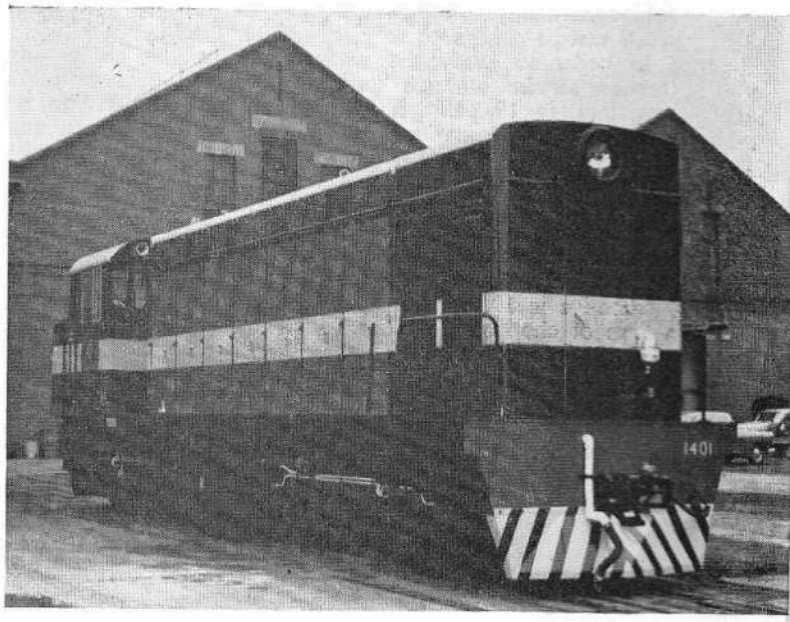
Although much of the equipment for the full control scheme is already developed, before its application to the *Hawk* the company intends to make a thorough investigation of the mechanism of flashovers, which continue to bedevil all electric traction machinery and of which all too little is known. Brush rightly feels that it would be foolish to jeopardise the chances of success of its new equipment through failure to do everything possible to guard against phenomena that might adversely affect the operation of the variable-frequency inverters.

In comparison with a conventional d.c. locomotive, a fully developed locomotive of the *Hawk* type would have the following advantages:—

- **Traction motors** of the squirrel-cage type to eliminate commutator maintenance and offer the ultimate in robustness and reliability. They are more efficient, waterproof if necessary and can be run faster and hotter; they can therefore be smaller and lighter, thus easing development problems as locomotive powers are increased.
- **Adjustable-frequency inverters** to replace commutators with all solid-state components of very high potential reliability. Unskilled maintenance is possible through provision of simple fault indicators and direct replacement of faulty units.
- **Alternator and rectifier** to eliminate brushes and commutator maintenance and provide the ultimate in generator reliability; an alternator can be run faster and can therefore be smaller and lighter. Short-circuit protection can be replaced simply by de-exciting under fault conditions.
- **Control circuits** to provide control of tractive effort at low speeds and the steep torque-speed curve required for optimum adhesion. Again, unskilled maintenance is possible through fault indication and rectification by plug-in unit replacement. Full automatic train control would be simpler with electronic control units.
- **Efficiency** of the *Hawk* transmission which, even with the present 500V thyristors, equals that of a d.c. system. Higher-voltage thyristors now under development (up to 1,000V 250A) will bring inverters with fewer individual components and provide higher efficiency.

The cost of the inverters is high at present due to high thyristor prices, but this is falling rapidly. In any case, the operational advantages of the a.c. locomotive should quickly offset a substantial initial price differential.

AEI DIESEL-ELECTRICS FOR NIGERIA



Within eight months of receiving the order, British industry has completed the first of a contract for 29 1,400 h.p. units. The business was won against strenuous foreign competition

PARTICULARLY gratifying for the British railway manufacturing industry was the placing in the U.K. last August of a contract by the Crown Agents for Oversea Governments and Administrations for 29 1,400 h.p. diesel-electric locomotives for the Nigerian Railway Corporation. The contract was put out to tender and hotly contested, particularly by American suppliers, but it was won by Associated Electrical Industries Ltd. It is valued at over £2m. and is the biggest order yet placed by the Nigerian Railway Corporation. The first locomotive has been completed within eight months of receiving the order, the second is nearing completion and others are following closely through the Midlands works of Metropolitan-Cammell Ltd. Four companies benefit from the order. A.E.I., the main contractor, is supplying all the electrical equipment; Metropolitan-Cammell is responsible for the mechanical units; and the diesel engines are being built at the Barrow works of Vickers-Armstrongs for Sulzer Bros. (London) Ltd.

The locomotive has a Co-Co wheel arrangement of 3ft 6in gauge and is of the hood type, with a full-width cab towards one end equipped for either direction of travel. It incorporates major units already in wide use in other locomotives and various points of design to meet specific operating requirements.

The Nigerian locomotives have been ordered for mixed-traffic work on the line between the port of Lagos and Kano, and possibly also on the recently-opened Bornu extension. They are equipped for multiple-unit operation of up to three units, controlled from the cab of the leading locomotive. Each locomotive is capable of starting and hauling 1,000-ton trains up the 1 in 80 gradients of the lines concerned and for a maximum service speed of 43 m.p.h., because of track conditions, though the design permits speeds up to 55 m.p.h. with full power available. Although consideration was given to the ordering of more powerful locomotives, the 1,400 h.p. unit was eventually chosen because existing drawgear strength and length of crossing loops would both have to be increased if more powerful locomotives were to be fully utilised.

Major components easily dismantled

The outcome is a locomotive that should be exceptionally well suited to Nigerian conditions. The layout is straightforward and in general the major components are pre-assembled as units and arranged for quick removal when necessary. The superstructure, for example, is built in three sections comprising the radiator group, the cab group and the engine compartment, all bolted to the underframe.

The welded underframe of the locomotive has I-section longitudinals which form the main load-carrying members and are designed to take buffing loads of 200 tons. The bogies are designed for overseas conditions, to give good riding qualities and avoid all unecessary metal-to-metal contacts. The pivots are rubber cones requiring no lubrication. Weight transfer is reduced by restricting the ability of the bogies to tilt relatively to the frame by fitting a second rubber cone unit, similar to the pivot, to the inner transom of each bogie. Manganese wear plates provide for bogie rotation. Tractive and braking efforts are transmitted through rubber-bushed links fitted between axleboxes and housings attached to solebars, eliminating metal axlebox guides.

Primary suspension is by coil springs between the bogie frame and equalising beams underslung beneath the axleboxes. Secondary suspension is provided by deflection of the rubber pivots and side bearer coil springs, which together carry the weight of the underframe. Primary spring seats are arranged to give taper axle loading—all outer axles carrying 12¼ tons each and the two inner axles 14¼ tons each—to reduce track stresses. The bogies are interconnected through their inner headstocks by a linkage and spring-loaded plunger arrangement designed to assist the bogies to take up the most favourable position through curves. Sandboxes are fitted at each corner of both bogies.

Sulzer engine as in BR Type 2

The locomotives are powered by a Sulzer 6LDA28C six-cylinder diesel engine, pressure-charged and intercooled to produce 1,400 b.h.p. at 800 r.p.m. at site, mounted approximately amidships. The same engine is used in the Commonwealth Railways locomotives already mentioned and a similar unit powers nearly 500 BR Type 2 locomotives. A difference is in the use of an 8-notch stepped control of engine speed in the Nigerian units. The direct-coupled main generator is an AEI TG5302W 10-pole machine with a single separately excited winding and an additional heavy current winding which is connected in series with the armature for motoring the engine. The continuous rating is 1,800A 500V, or 1,200A 750V, at 800 r.p.m. The exciter, an auxiliary generator and one of two traction motor blowers are all driven from a gearbox fitted to the main generator end frame.

The exciter has a field system divided into three sections, the first a self field with current determined by exciter speed, the second a differential field with current proportional to armature current and the third a battery field connected in series with the engine load regulator. Interaction of the three fluxes regulates excitation to give the generator output required. Two of the locomotives ordered are to be equipped with dynamic braking, for which the traction motors are reconnected as generators and the resultant energy is dissipated through force-cooled resistors. For dynamic braking the exciter fields are reconnected to limit

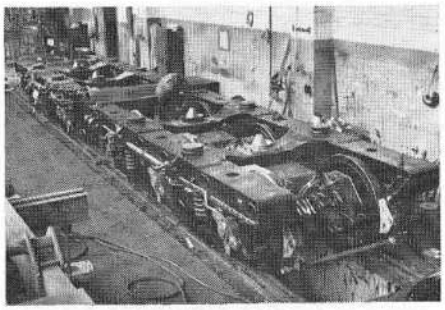
maximum braking current in accordance with the position of the driver's brake controller.

Two units have dynamic brake

The six axle-hung AEI Type 253 traction motors are each rated at 600A 250V (1,685 h.p.) at 375 r.p.m. and drive through spur reduction gearing with a ratio of 19 to 92. The Class H insulated four-pole series-wound machines have been employed on various diesel-electrics, from shunters up to 2,750 h.p. locomotives, and also on Indian 25kV a.c. m.u. stock. On the Nigerian locomotives the motors are connected permanently in pairs in series and the three pairs are connected in parallel across the main generator. Two stages of field weakening are employed at 42 per cent and 22.5 per cent full field. Automatic selection of weak field is made by tuned circuits of different resonant frequency, fed from a single alternator mounted on No. 4 axle. The same alternator controls a locomotive overspeed protection device. Two wheelslip relays connected between motor circuits are arranged to give audible and visible warning in the cab and to reduce engine power through an override solenoid as long as wheelslip continues.

A Metcalfe-Oerlikon vacuum-controlled direct air brake system is fitted to control the air brakes on the locomotive and vacuum brakes on the train, through separate brake handles at each driving position. The handle controlling the train brakes also normally operates the locomotive brakes proportionately, but the locomotive braking can be switched out when desirable. The locomotive brake rigging is of the simple single-block type, with one brake cylinder and integral slack adjuster on each side of each bogie. The handbrake operates only on the bogie immediately below the cab. The dynamic brake fitted to two of the locomotives can produce a peak braking effort of 28,000lb at 20.8 m.p.h.

The cab has two free-standing master controllers with two seats adjacent, each of the swivelling type to face either direction of travel. A third tip-up seat is fitted to the bulkhead. Vision towards the short nose end is through large armour-plate glass windows fitted with pneumatic wipers and towards the other end through windows giving a view along the walkways at each side of the hood. The usual instruments and gauges, deadman's hold-down button and Hasler speedometers are provided at each driving position; a speed recorder is also fitted.



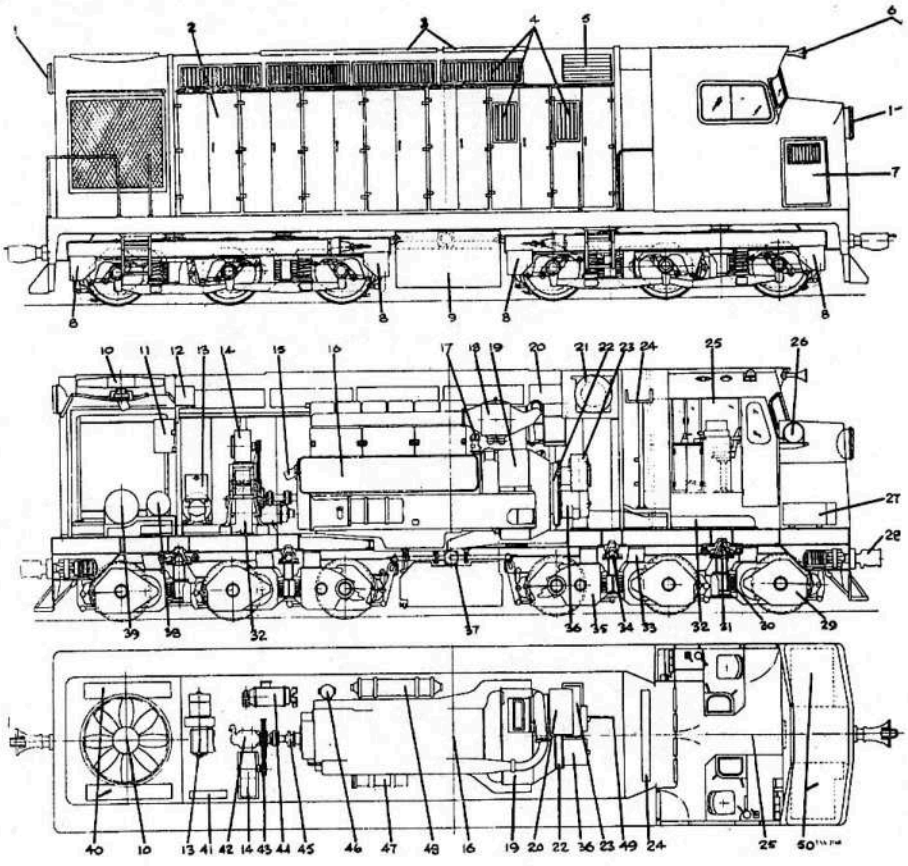
Above: Bogies of a 1,400 h.p. diesel-electric for Nigeria.

Below: The auxiliary driving position in the cab of one of these locomotives.

KEY:

1 Headlight
2 Engine compartment doors
3 Removable roof sections
4 Filters with louvres
5* Dynamic brake filters
6 Horns
7 Battery box doors
8 Sand boxes
9 Fuel tank
10 Radiator fan and hydrostatic drive
11 Hydrostatic system make-up tank
12 Water header tank
13 Exhauster
14 Traction motor blower No. 1
15 Hydrostatic drive pump
16 Diesel engine
17 Governor
18 Inter-cooler
19 Main generator
20 Turbo-charger
21* Dynamic brake blower motor and resistors
22 Generator gearbox
23 Traction motor blower No. 2
24 Main control frame
25 Cab
26 Control air reservoir
27 Battery
28 Coupler and drawgear
29 Traction motor gearcase
30 Traction motor nose suspension unit
31 Fixed pivot with traction links
32 Traction motor air ducts
33 Traction motor flexible air ducts
34 Sliding pivot
35 Traction motor
36 Auxiliary generator
37 Inter bogie control linkage
38 Auxiliary air brake reservoir
39 Main air reservoir
40 Radiator panels
41 Brake frame
42 Air compressor
43 Traction motor blower belt drive
44 Pump set
45 Compressor flexible drive shaft
46 Lub. oil strainer
47 Lub. oil filter
48 Lub. oil cooler
49 Exciter
50 Battery boxes

*Fitted only to locomotives equipped with dynamic brake.



Leading Dimensions

Gauge	3ft 6in
Total weight	78½ tons
Axle load (centre axles)	14¼ tons
Axle load (outer axles)	12½ tons
Length over buffer beams	43ft 1in
Overall height	13ft
Overall width	9ft 7in
Minimium radius curve	350ft
Continuous engine rating at site	1,400 h.p.
Maximum tractive effort at rail	60,500lb
Continuous tractive effort at rail	40,500lb
Maximum service speed	43 m.p.h.
Fuel tank capacity	700gal

British Railways and Industrial Design—1

BR's new corporate identity has provoked more argument on the relevance of industrial design to railways, of which we reproduce some recent examples. First, in a paper to the Institution of Locomotive Engineers, of which this is an extract, one of BR's principal design consultants, **E. G. M. WILKES,** *stressed that good appearance is not something added to engineering design; it should be part of the overall concept.*

A DESIGNER'S LOOK AT BR ROLLING

WHEN outside designers with little first-hand knowledge of railway requirements appeared on the scene nine years ago, some resentment was to be expected. In point of fact this intrusion was part of a growing awareness that something was lacking in the design of engineering products as a whole. Strangely enough, the realisation of design deficiencies did not come from engineers, but from isolated managerial sources. To begin with it was thought that the fault was one of appearance only, but today it is more widely understood that the remedy lies in the correct definition of design and its method of control.

Good design must be functional

When we say that a product is a good or bad design we are thinking of the overall characteristics—performance as well as reliability; appearance as well as safety; ease of maintenance as well as ease of manufacture; quality as well as economy, and so on. The designer's part is therefore to analyse, create, visualise and co-ordinate the design *as a whole*. Appearance and amenities are integral parts of the overall design concept and not items to be added to the engineering design. The great locomotive engineers of the past were designers in this overall sense and that is why examples of their work possess such a strong indication of unity of thought and visual simplicity. In contrast to this, and just after the last war when technical advances had almost outstripped industry's ability to use them intelligently, British motor manufacturers made the mistake of thinking that by employing sufficient engineering specialists on every part of a car, good design would automatically follow. But it is not enough to string together separate engineering solutions to the various problems, and the resultant vehicles were the most uninspiring in the history of that industry.

One engineering designer can no longer be expected to control all the factors in such a complex product as a car or a locomotive. The obvious division of design effort is between the mechanical and the human considerations. This is the point at which the industrial designer comes into the picture, because his particular form of design training is largely centred around operational and visual requirements. But these factors cannot be divorced from the mechanical design. The statement in the Fielden Report that "no one feature of a design should be considered on its own because others are dependent on it" may seem obvious but it is not always put into practice.

In short, it is the controlling hand of the overall designer that is essential. Whether he is an engineering designer or an industrial designer or both depends entirely on the nature of the product and the circumstances. All three alternatives regularly produce good design.

Principles of cab design

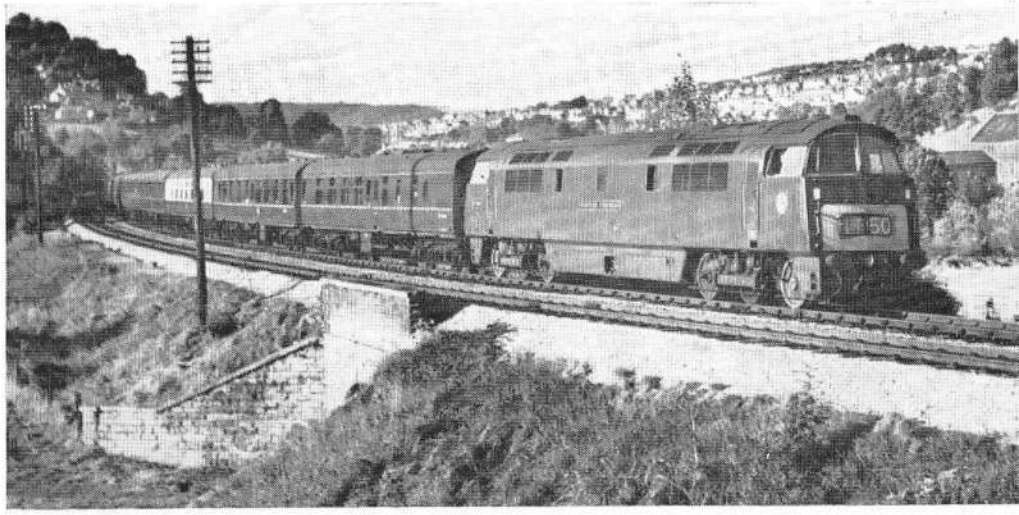
The industrial designer's introduction to locomotives was concerned with improving the appearance of designs that were already well on the way to completion, and thus these early efforts were far from satisfactory. By 1960, working arrangements between industrial and engineering designers had greatly improved but there was still need for closer co-operation in some instances. A typical example is the position of the cab floor related to the commencement of the roof curvature. If the floor is high as on the Brush Type 2 locomotive windows and doors cut into this roof curvature, hence the need to recess them. But a slightly lower floor level as on the Birmingham RCW Type 2 makes this recess quite unnecessary. Alternatively, a slight inward slope to the body side can have the same effect by striking the roof curvature higher up. It is more than likely that such adjustments could be accommodated if considered at the very commencement of the design. In fact this becomes essential with any attempt at improving streamlining.

Driving vision is another important item affecting the design of a cab. In 1956 the railway attitude was that diesel locomotive windows should be small to minimise dazzle and distraction. The basis for this opinion seemed to come from drivers, who were accustomed to the small windows of steam locomotives or Southern Region multiple-unit trains. At the other end of the scale, the industrial designer was conscious of the wide vision conditions of modern buildings and road vehicles. These latter spheres of activity have proved that the restricting outline of a small window and the contrast in light intensity from the outside to the inside of a relatively dark cab are far more likely to produce fatigue than the supposed distraction of seeing too much. In road vehicles of all types there has been no question of reducing vision to pre-war standards. Thus, when designing the cabs for the Brush, Birmingham, and Hymek locomotives it was decided to provide ample panoramic vision to right and left, but some degree of restriction to the depth of the windows to avoid undue dazzle from the sun or from the rail sleepers. The forward vision depth of the Brush Type 4 is about 23 in. measured vertically. However, as speeds in the region of 100 m.p.h. become more common, a further factor has to be taken into consideration—the greater risk and effect of glass breakage. There is no reason for a sudden reversal of thought just because of this factor so long as designers are conscious of the need to moderate glass areas accordingly and do not attempt to compete with the very large windscreens on some of the latest road coaches.

Operating requirements are restricting

The frontal shapes of cabs are of course controlled by the severe operating restrictions demanded by British Railways. To begin with, the driver has to sit to one side to be able to lean out of the side window whilst still at his controls. This is an operational requirement. Then the windscreen glass has to be flat because until recently the gold film type of defroster could not be fitted to curved glass—a technical limitation. At the same time the body panels have to surround a full width conventional buffer beam (a design restriction) leaving 15in between the front panel and the buffers (an operational requirement). These four restrictions make a flat front unavoidable.

In the case of the Brush and Hymek locomotives, the



Above left: Hymek Type 3 No. D7024 and "Warship" Type 4 No. D848 *Sultan* at Swindon works. *Photo by M. Edwards*

Right: "Western" Class Type 4 No. D1012 *Western Firebrand* in the Stroud Valley near Ham Mill Halt with the 15.50 Cheltenham–Paddington on September 26, 1964. *Photo by G. T. Robinson*

Below left: "Warship" Type 4 No. D826 *Jupiter* leaves Westbury with a Plymouth–Paddington express on June 8, 1964. *Photo by D. Cross*

STOCK TODAY

window and louvre requirements, together with the need to counteract the static effect of the flat front, produced a picture of the locomotive with the accent on the horizontal lines. Another industrial designer working on the WR's Type 4 D800 and D1000 locomotives was probably more concerned to co-ordinate the locomotive with the rest of the train and saw a greater importance in exploiting the cross-sectional contour. Both are perfectly logical approaches. Although there may well be other answers, the industrial designers in question have built up their experience by being consistent over a number of locomotives. The more experienced one becomes the more one is aware of the impossibility of laying down any rules or formula for obtaining a satisfactory appearance. It is something sensed rather than calculated. One is conscious of steering the engineering partly to suit appearance; partly doing the reverse; partly providing a visual unity of the external features; partly suiting the appearance to the performance; and always having the overall effect in view.

Analysing such conditions and striking the right balance between conflicting requirements is a familiar exercise to all designers. The front view of the Hymek locomotive, a typical example of the horizontal treatment, shows this. This locomotive is comparatively light in weight. The usual restrictions made it impossible to employ any worthwhile streamlining, but as the maximum speed is 80 m.p.h. it is just short of the speed range that really benefits from streamlining it was therefore decided to accentuate the feeling of light weight, stability, and movement. Shallow sweeps, sharp corner radii and a thin roof reduce any feeling of excessive weight. Long horizontals give an impression of width and low build, and the inwards slope of the sides produces an effect of stability. The prominence of the waist line and the rearward sloping windscreen above it and the forward sloping front panel below add to the effect of power and movement. An interesting comparison can be made with the German V200, where a very rounded and rearward sloping frontal shape is used and the impression is one of static power and great weight. These are typical appearance factors over which the designer can exercise a certain amount of control, and yet it should be noted that the practical requirements of the Hymek windows, doors, route indicator, buffers, etc., fit into the overall scheme quite effortlessly.

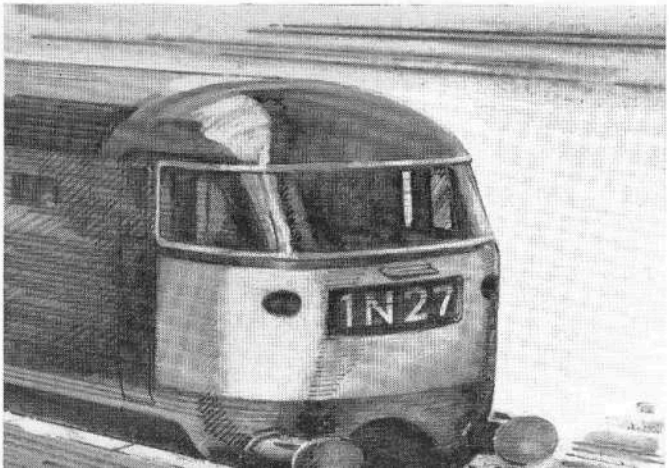
A streamlined Type 4 cab design

The latest thoughts on the front-end design of locomotives have been concerned with improving the streamlining of the more powerful types. Speeds in the region of 100 m.p.h. are going to become more frequent and although the frontal resistance is only a small proportion of the total air and rolling resistance of a complete train, tests have shown that a saving of as much as 150 h.p. is possible.

A recommended new frontal shape has been realized in a designers' model (*see drawing on this page*). It can be referred to as semi-streamlined to distinguish it from the existing unstreamlined front and the possibility of a fully streamlined version. The latter, however, is not really suitable for locomotives, but it is an obvious choice for a more advanced form of multiple-unit rail travel.

Naturally this semi-streamlined version cannot be obtained without lifting some of the present operating restrictions. For example, the driving position has been moved from the side to the centre of the cab to avoid possible distortion of vision from the corner glass. Constructional modifications include an increase in frontal overhang by a few inches, the inward slope of the body sides by about 1½in and the re-design of the buffer and coupling mountings. The grab rails retract inwards as soon as the locomotive is in motion and the mounting steps have "kick-in" flaps. The windows are shallow but give a completely unobstructed side to side vision. The centre screen pillars are triangular in section, 2¼in maximum width and with the apex of the triangle angled inwards towards the driver. Ample strength can be given by sufficient fore and aft pillar depth and the narrow width enables the driver to see "round" the pillar without producing a blind spot. The shaping of this cab pays due regard to wind tunnel tests on

Above: Brush Type 4 2,750 h.p. diesel-electric No. D1547 arrives at York with a Kings Cross–Newcastle express. *Photo by Eric Treacy*



Left: An artist's impression of the semi-streamlined front end experimentally designed for the Brush 2,750 h.p. Type 4 diesel-electric of BR, which is referred to on this page.

models based on the overall dimensions of a Brush Type 4 cab. The results showed that worthwhile advantages could be expected from such restricted streamlining, particularly if all projections were eliminated. Unfortunately the final appearance of the wind tunnel model was unsatisfactory—as is always the case when the corners of an inherently poor streamlined form are rounded off in all directions.

On the other hand, there was no question of trying to achieve the ultimate in streamlining at the expense of all else. The maximum operational speed envisaged for this design was 110 m.p.h. and then only over short distances, and the value of frontal drag relative to the complete train is not as critical as in the case of a car or an aeroplane. The prestige value of good appearance is of considerable importance in selling rail transport, whilst operational requirements still demand buffers, exposed bogies, and cabs at both ends. Finally, provision had to be made for an opening window in the cab which in itself affected the shaping. This assessment of the overall requirements resulted in the design shown although so far this is no more than a preliminary investigation.

A new Tokaido line look for BR?

At the same time, the possibilities of a fully streamlined cab for either end of a fixed multiple-unit electric train were briefly considered. A new cross-sectional contour giving greater visual stability proved essential and the overall height also needed to be reduced slightly. Inevitably there must be a similarity of appearance between any such front end the nearer one approaches the ideal streamlined form, and thus a resemblance to the Japanese National Railways New Tokaido line trains was to be expected.

As a result of these investigations there seems to be a good case for three types of cab as a future policy. The existing flat fronts would still be essential for Type 2 and 3 locomotives, the semi-streamlined version being desirable for Types 4, 5 and 6 with speeds up to 110 m.p.h., but which still need to be double-ended and to have buffers, reduced overhangs, and so on. This leaves the fully streamlined front-end for special high-speed multiple-units where restrictions can be relaxed.

The variety of locomotive designs commissioned by British Railways in the short period of about six years has been severely criticised, and the decision to make five of them standard types appears to have been done with some reluctance, possibly to appease the critics. The benefit of standardisation in an organisation such as the railways could be enormous, but it requires a definite policy—first, of organised design development towards a positive objective; secondly, of timing so that the introduction is not a long drawn-out process (as is happening with the XP64); and thirdly, of a sensible maintenance of the standard design for a reasonable period despite the distractions of continual technical improvement.

Standard diesel look belies new "image"

In many cases the opportunity of doing this on a large scale within the present programme has been lost, and bearing in mind that a policy of standardisation requires the best in design at any given period of time, it is unfortunate that three out of the five locomotives chosen have all the outward evidence of belonging to the world of the engineer rather than of the designer. Certainly the attempt to build up the prestige of the railways with new uniforms, better carriages, and new stations is given a sharp jolt by the sight of some of the new standard locomotives.

The interiors and exteriors of locomotive cabs and carriages provide a great many amenity and appearance problems that cannot be settled with complete certainty on a drawing—for example, the exact shaping of a cab roof; the degree of comfort of a seat; the positioning of a grab rail; the effect of a colour scheme; the extent of vision. However experienced the designer, the element of doubt must frequently exist. There is also the difficulty of conveying ideas to others in a convincing way. These problems are of vital importance if tooling is involved or if a long period of standardisation and use is required, as with railway equipment.

Preliminary mock-ups are essential

The motor industry has been to the forefront in perfecting mock-ups as the best way to overcome these difficulties of decision, and in parallel with this they have become extremely proficient in drafting techniques so as to tie down the results in a positive manner. In the case of diesel locomotive cabs, full size mock-ups were made in a few early instances by the manufacturers, but they were crude and only partly successful. In one case the mock-up was even panelled in sheet metal so that it defeated the whole object of the exercise. No mock-ups were made for the later locomotives.

The "Blue Pullman" and the Glasgow suburban electric trains were among the first completely new carriage designs since the war and mock-ups played their part in the success of both. The manufacturers of the Glasgow train, with a background of motor industry methods, went to the extreme of producing three mock-up carriages (one of each type) complete in every detail. All the development work of interiors and exteriors was based on these mock-ups and their value was firmly established. The third completely new train was the XP64, and on this occasion the industrial designers themselves made full-size mock-ups of first- and second-class compartments, a second-class open saloon, and a toilet and entrance vestibule.

The carriage designs for the XP64 were intended for standard main line locomotive-hauled stock, and right from the start the designers avoided unnecessary variations of major components. Thus it was realised that the tooling costs for the second-class glass fibre seats would only be justified if all mouldings were identical. All body shells, windows, and doors are standard and only three types of ash-tray are used—a wall-mounted

The mock-up of the prospective lounge car for BR, which is referred to on this page. *Photo by Council of Industrial Design*

version, and narrow and wide armrest versions. It was also considered highly desirable to reduce the types of passenger carriage and concentrate on comfort and amenities. Clever use of materials, colour and finishes can give ample visual variation.

Lack of design policy a handicap to XP64

Overcoming teething troubles and refining details have not proved a serious problem on this train. As with the locomotives the biggest drawback has been the lack of an official design policy, and the co-ordinating and controlling influences that go with it. The XP64 has shown that by having to consider individual preferences of so many people it becomes extremely difficult to terminate the design. Thus in the next project—the interior design for a luxury carriage for use on certain express trains—a more dynamic approach was adopted and only three people were directly involved. As before, the designs, the drawings and the full-size mock-up were completed by the consultant designers under the supervision of the British Railways Director of Industrial Design, but this time the complete design, including drawings and mock-up, took only five months and the result has proved generally acceptable without modifications. This was a deliberate attempt on the part of the designers to speed up their own designing process. There can be no doubt that there is room for improvement here and also with regard to clarity of design brief, positive indication of design responsibility and control of outside opinions in the early stages.

British Railways and Industrial Design—2

MODERN RAILWAYS is convinced of the important role industrial design has to play in creating an updated BR image. But not so this railwayman, who voices the extreme view that the industrial designer is an unnatural partner for the railway business

A fig for the designers

THIS is an age in which the appearance of the package seems to matter, not the contents. A rich, large and growing industry has been founded on that assumption. But what information is there to support it?

Plod through all the evidence you can find, all the convincing claims of increased custom and goodwill, and the odds are that you will find that they all emanate from the very sources which have most to gain by fostering the idea. At least this shows that the industry is good at selling itself. Not so easy to come by is scientific, irrefutable evidence that advanced forms of presentation and image formation of themselves have ever improved the lot of any concern more than it might have been by the issue of honest and adequate information on what it has to offer.

Other things being strictly equal, it may be true that presentation is a decisive influence on consumer choice. This, of course, is where the producers of petrols, soap powders and similarly indistinguishable competitive products get on a merry-go-round that they cannot get off. Why British Rail(ways) should think it is likely to have any application to their parlous lot is obscure.

There have been similar attempts in the past, of course. But the awkward customer persists in being more impressed by what the machinery inside the locomotive does and how cheaply it does it than by the extravagantly curled metal in which it is enclosed, or by how effectively the stationmaster controls his station rather than by his *Britische Bundesbahn* uniform.

The working out of the present corporate identity campaign has obviously consumed a lot of the energies of many highly-placed people. They might have been better occupied in seeing to it that the system knuckled down to the job of giving attractive and economical service.

There is, of course, no harm in thinking about the visual impact on the public of new equipment or installations while one is designing them, or of how the development may be publicised advantageously, so long as these things are considered as a matter of course. It is when they become the subject of highly self-conscious "expert" thought that they become obsessive and the damage is done. If the thing is to be done properly, the impulse and the solution must spring spontaneously from the normal process of development, like any other design characteristic. When the effort is forced in from outside, as it has been until now, the effect is actually to frustrate the development of a true style, because the artificialities produced and the excessive attention they get inspires only resentment among those who are and have to remain responsible for the tangible aspects.

Even so, the question remains: what is it all worth? The people in the presentation business are very sure that they know and so are those outside it who want to appear well up with their times, or even a bit ahead of them. For the rest, it remains true that what attracts one man repels another; and who is really entitled to the conceit of saying what is right in any absolute sense? One might legitimately aspire to judge what is generally accepted as the most attractive, without raising any question of taste. But on this little hard information has been produced, so little may be assumed to exist. The role of aesthete may therefore be easier.

What is incontrovertible is that a lot of money has been spent in recent years on wrapping metal tortuously around sometimes indifferent locomotives and trying to make glass bend into shapes that it does not naturally favour, in an effort to create a good impression; but that it all seems to have failed its purpose, if traffic receipts are any measure of success. The pundits of BR ought to have profited from this sobering experience; but obviously they have not. So, with carefully and no doubt lengthily pondered new colour schemes, new shapes and not least a new title and a new totem (if the use of such a passé word may be forgiven), the hunt for the philosopher's stone is still on.

Two afterthoughts: Isn't it a pity that the fish merchants were so much less impressed by the new colour of BR fish vans than by the fact that BR stopped running the vans to the places they wanted them to go? And isn't it amusing after 40 years or so to find so many still vainly but industriously trying to devise a brand half as good as the old Imperial Airways Speedbird?

British Railways and Industrial Design—3

A former PRO's view

More temperate criticism of the BR corporate identity was expressed to the Transport Architects' Society by **GEORGE DOW,** *whose views we have summarised. Mr. Dow, now LMR Divisional Manager, Stoke-on-Trent, was putting his personal opinion as a former PRO with long experience*

Whilst the four main-line railways after grouping in 1923 were as livery-conscious as their predecessors, none assumed a house style embracing the whole undertaking. The LNER's adoption of the Gill lettering and totem and the increasing use of blue certainly represented the nearest any grouped company got to a recognisable house style. On nationalisation in 1948 the decision was made to use the Gill Sans type extensively, a wise decision, because it did something to achieve unity at the very outset. Mr. Dow said he knew of no nobler type than Gill for the display of the printed word or numeral on signs, rolling stock, timetables and letterpress posters; after 17 years it had become identified with nationalised transport and he was dismayed to see it now being unceremoniously interred. "Regions" was an unhappy choice of nomenclature to describe railway systems, together with individual Regional colours. One could readily understand the thinking behind this decision to use different Regional colours, but it was unfortunate as regards signs. At this time LMR signs of all kinds became one of Mr. Dow's responsibilities and he had pleaded for a standard colour for all Regions. The LNER just then was extensively using vitreous enamel with white Gill letters on an Oxford blue background and the Southern had made even better progress with white letters on green. Either would have been suitable for general adoption or, alternatively, black letters on a white ground, to which the BRB was now coming round. Of the Regional colours adopted, drab chocolate for the Western, tangerine for the North Eastern and light blue for the Scottish were not happy choices for signs, especially those which were hand-painted. When the BTC came into being, its Railway Executive made the Regional PR & POs responsible for implementing and developing the basic and straightforward code it had evolved for station signs. This was a most sensible thing to do, for few other physical items of equipment, Mr. Dow emphasised, could have greater visual impact on the travelling public. Hitherto, engineers, architects, operating superintendents and commercial managers had all dabbled in signs, often with unfortunate results. Signs were an art and a science in themselves. It was fundamentally wrong to embody them, as BR was now doing, in the lanterns of modern lighting fittings. The requirements of the two were often diametrically opposed, for the sign should be on or near eye level whereas the lamp, to be effective, had often to be high, so as to diffuse its illumination. The PR & PO was the best single person in whom to vest responsibility for the production of signs. Of all officers he was, or should be, most closely in touch with current design where it was concerned with publicity. As regards the traffic aspect he should be well versed, both at H.Q. and at Divisional level, with the problems which arise in running

trains and handling passengers. Unfortunately, during recent years, there had been a tendency for architects to enter the field of railway signs. This was proper in the design of a cathedral or similar architectural conception, but it did not apply to a railway station. There the transport architect's first responsibility was to his client, namely the department charged with winning and moving traffic. The design of signs, their need and siting could not be left to the whims of individual architects; the design was a specialist function, the need and the siting the direct concern of those who move the passengers. Some really silly things had been done with signs at some new BR stations. He showed slides of unsatisfactory signs at new stations, such as Tamworth, due to intervention of the architect.

Mr. Dow said that he had heard criticisms in business circles of the latest BR symbol (suggesting two-way traffic and electrification), which had been dubbed the "barbed wire", and whose bi-directional character had evoked sarcasm. Was it really better than the totem it replaced, which was instantly recognisable? Should not the new symbol have been so obviously better as to make comparison not worth debating? In a vast national and nationalised concern such as BR, something which might be acceptable, understood and even liked by a sophisticated Londoner might well be puzzling, misunderstood and even derided by "the barbarian living north of Potters Bar". Mr. Dow was unhappy about the mutilation of British Railways on the altar of a new logotype ("British Rail"). On numerous occasions members of the public had said how much they disliked it or questioned its necessity. The January issue of *Design* commented that the new name offered no great advantage and had an odd connotation, particularly when spoken. So far he had been told only one argument in support of its introduction, namely, that "it is simple to read and comprehend"; if there was any substance in that, then the British really had become a race of morons. What worried him, as a traffic officer constantly striving to close the gap between revenue and expenditure, was the prospect of money being spent at places which already had been equipped throughout with modern vitreous enamel signs, although in Regional colours. The number of such places must run into many hundreds and the total cost into several hundreds of thousands of pounds; furthermore, the signs had many years of life in them. He had no doubt at all what the reaction of the staff would be. He was not, he stressed, denigrating the concept of a corporate identity programme; it was a very desirable thing. But they must proceed with caution. Its basic integrity must be above constructive criticism. It was easy to change the style of ephemeral things such as posters, press advertisements and publications. BR just could not afford to keep making fundamental alterations to physical equipment such as stations, locomotives and rolling stock. They must be so sure now of the soundness of their ideas that these would stand up to criticism of their successors.

British Railways and Industrial Design — 4

Why BR needs a new design idiom

At the Transport Architects Society Mr. Dow was answered by **GEORGE WILLIAMS,** *Director of Industrial Design, BRB, whose remarks we have also summarised. Indirectly, he also dealt with the anonymous attack on page 328.*

THE early railway engineer, in laying the foundations for and later developing an original and exciting transport concept, was determined to see that it was presented in a manner which befitted the standards of his technical prowess. This he seems to have done instinctively, without fuss and with an unerring attention to detail. His rolling stock, his bridges and buildings show an instinctive feeling for rightness in design and colour. I do not believe he was conscious of the need, as we are, to create a "public face" for a railway system. The high standards he created—from a good livery to a graceful viaduct—were the natural outcome of discipline in design, the kind of discipline which so often escapes us today. Yet it was, in effect, a "house style" these engineers created, through their conviction and discipline, and this was destined to affect the work of successive generations of craftsmen in the industry.

No modern designer can look at Daniel Gooch's design notebook, the standards of his designs and his ability to draw, without deep admiration. It is this admiration which gives rise to our nostalgia about the railways of the past. This, to my mind, develops into a sort of romanticism, which is all very well so long as it is contained within bounds. It is a thing we can enjoy like a glass of port, but it can become cloying and restrictive if we try to extend its effect into the rude commercial environment of today. What we must do is to learn the lessons of the past. What we must not do is to go on applying the outdated facets of styles which were no doubt excellent contributions to their own environment and day. When I say this I think, amongst other things, of maroon for coaching stock, of chocolate and cream, of municipal green and tortured lions jumping over railway wheels. Maroon is a gracious colour from a gracious period. It was a fashionable colour of its day. It can still look good on a coach-built Rolls-Royce; but would it look well on a VC10?

Why is heraldry, for which we have the highest regard, thought to be all right on a fast-moving machine? Why upon a 100 m.p.h. locomotive do we still solemnly inscribe an expensively contrived steel banner, 6ft long, with the name of a crack regiment which has little or nothing to do with modern transport? We should certainly find this embellishment slightly peculiar on the New Tokaido line expresses of Japan.

There have been many attempts to get away from the dominant influences of the past. Attempts have been made since the turn of the century to achieve a modern idiom on its own merits — first *Art Nouveau*, then Modern; (mainly derived from the Scandinavian) and yet no pure English strain emerged. But now, in the late 1960s, I believe we can really begin to see British design freeing itself from foreign and past influences.

A saddening feature of past railway design in this country has been the gradual weakening of the heraldic image. The British Lion, when associated with the railway image, became tortured and caricaturised. The "flying sausage" emblem, for which many apparently authentic design origins have been claimed, is nothing more than a piece of appallingly bad graphic design derivative of the style of the '20s, and when used with various Regional colours for station signposting has none of the eye-catching qualities of the infinitely superior red and blue London Transport "target".

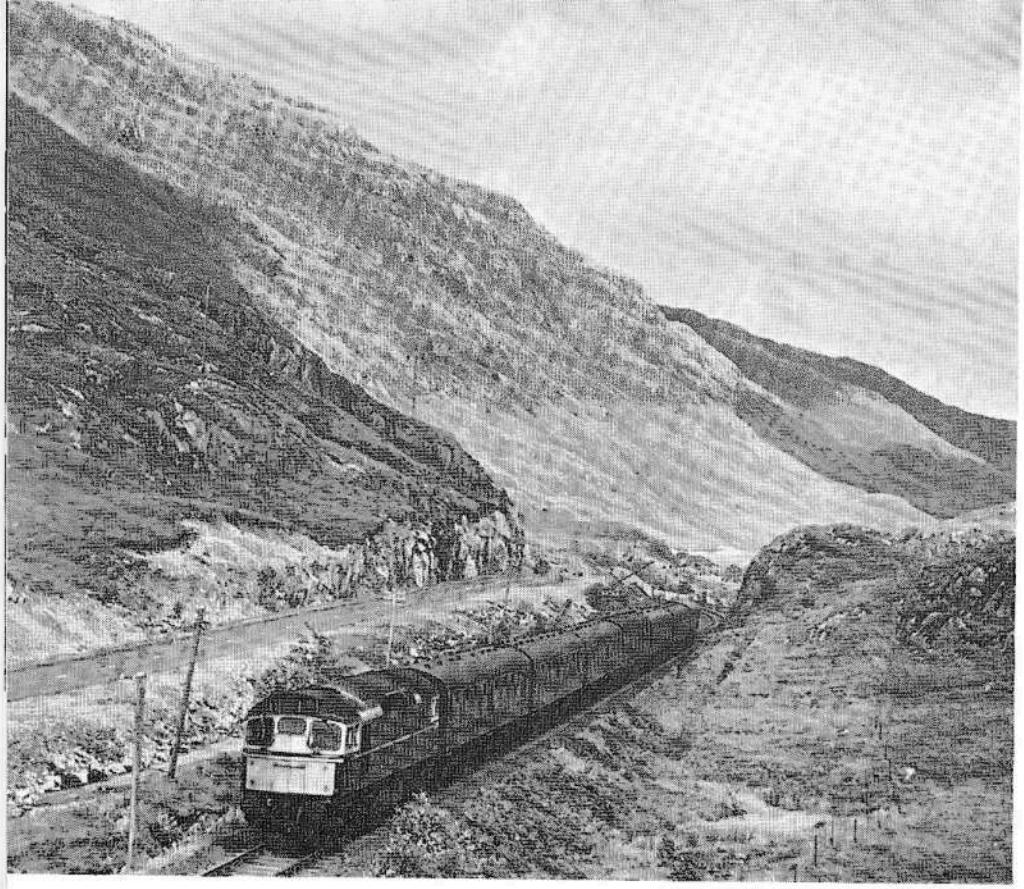
BR's present visual image in terms of symbols, lettering and colour is negative and Victorian and certainly out of step with technical advance. Far too much of the front BR shows to the public—train liveries, uniforms, signposting, etc.—remains an ill-thought out perpetuation of steam-age railway fashion. The railways have lost their persona as an undertaking in this medley of confusing visual associations and become out of focus to the public eye. No better way of getting them back into focus exists than the kind of design which immediately conveys the intrinsic qualities as they were expressed so well in the past, and by so doing helps to produce a customer-orientated railway trimmed for competitive action.

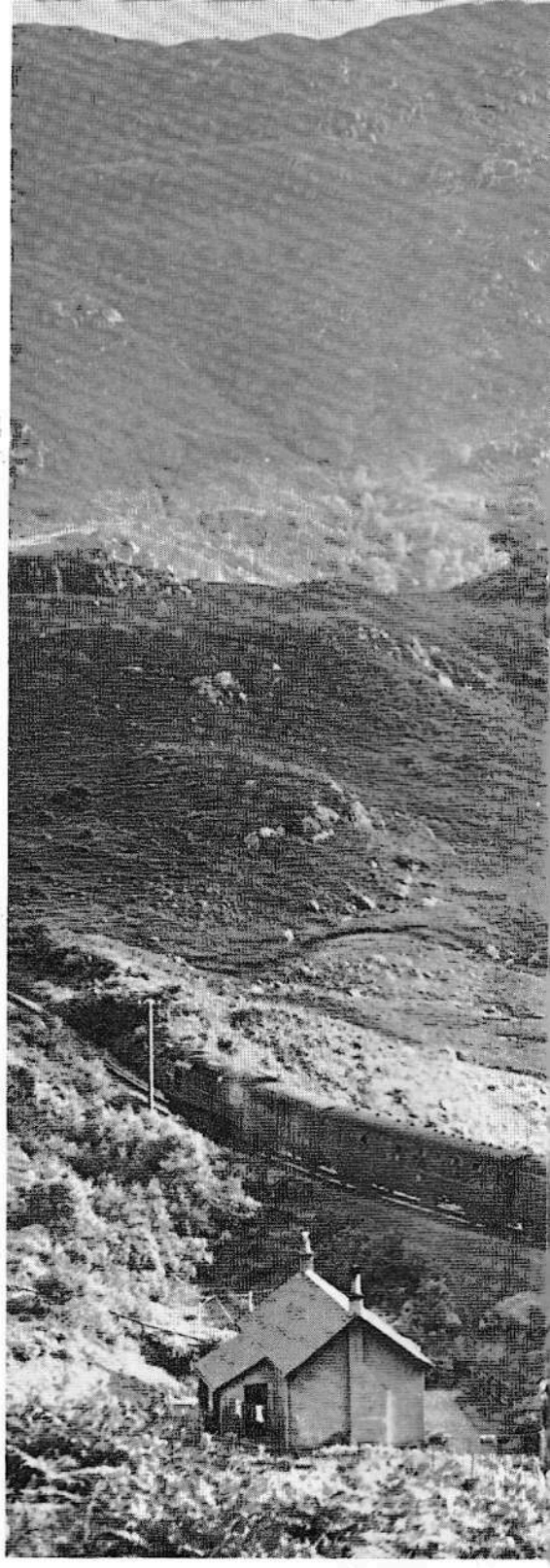
Mr. Dow mentioned the advantages gained through the wholesale introduction of Gill lettering. This was undoubtedly a wise decision at the time and proved to be one of the more successful forms of standardisation ever introduced by the railways. No one would doubt the authority of the Gill face, but it was not designed for maximum legibility and it fails to a considerable degree for our kind of use where legibility is the dominant requirement.

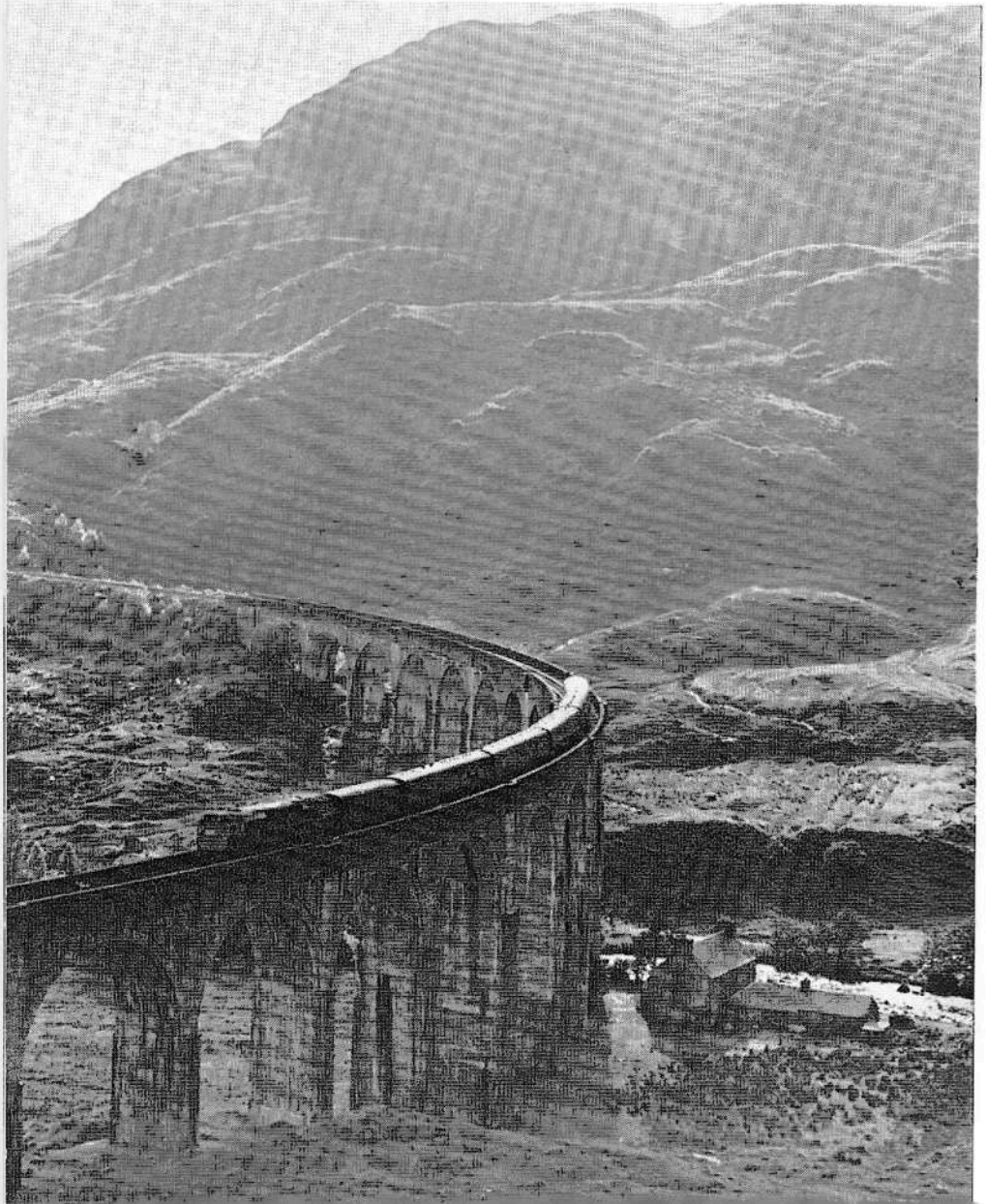
In recent years there have been major advances in the design of lettering for public usage, particularly in the spheres of transport, and it would indeed be wrong if BR were to ignore the qualities of legibility and ease of application that have resulted. We are confident about the practicability of the new lettering, and certainly about the abbreviation "British Rail", which is the kind of strong, hard-hitting phrase we need to help sell our service.

The future of BR depends upon what the travelling public and industry think of them. To create the right public impression we must provide good service and also present an appearance of smartness and efficiency. Neither is a substitute for the other; both are necessary.

The best way of creating the right visual impression of an organisation as widespread as ours is the consistent use of the same well-designed distinguishing features wherever they can appropriately be embodied. This gives cumulative impact to the features used, causes the organisation's facilities to be easily recognised, and produces a corporate identity which reflects the unity of the organisation behind all our activities.







focus

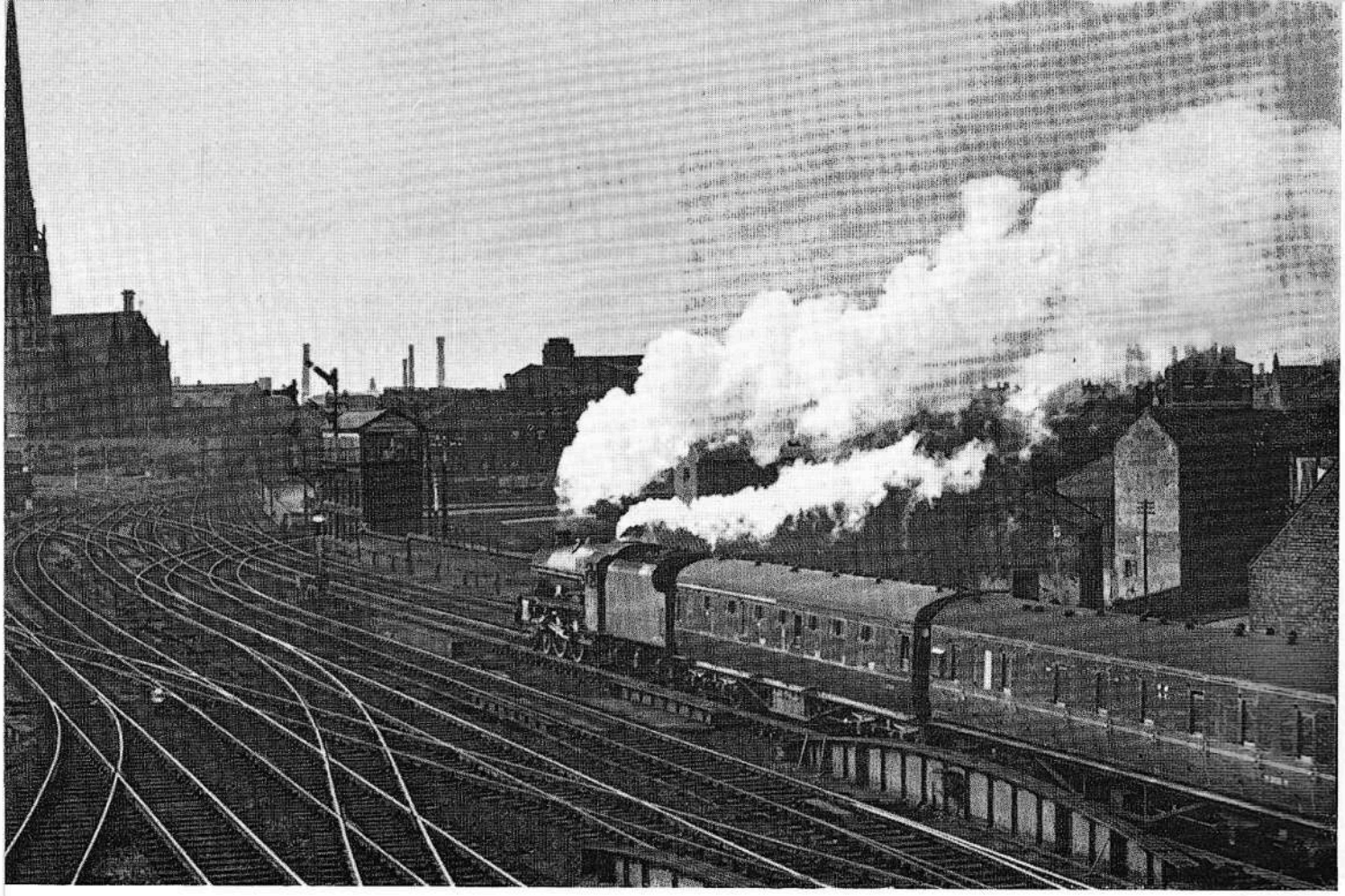
ON THE WEST HIGHLAND LINE

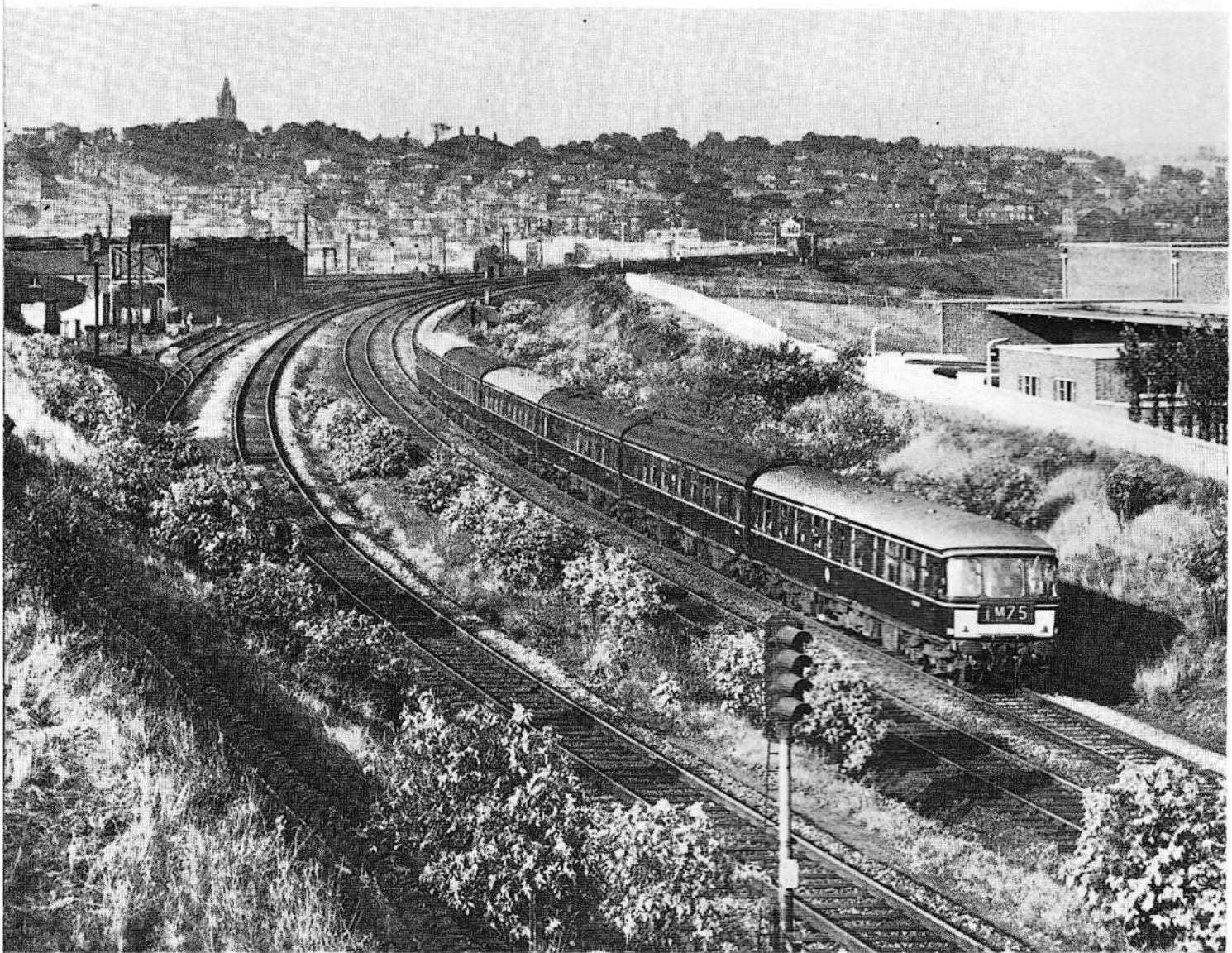
Photographed by PAUL RILEY

Above left: A Fort William–Mallaig train between Glenfinnan and Lochailort, headed by a Birmingham RCW Type 2 diesel.

Below left: Another Birmingham RCW Type 2 diesel, No. D5385, crosses Glenfinnan Viaduct with a Mallaig–Fort William train.

Above: The same train, with an ex-"Coronation" streamlined observation car bringing up the rear, climbs away from Glenfinnan Viaduct. All three photographs were taken on July 15, 1964.




M75

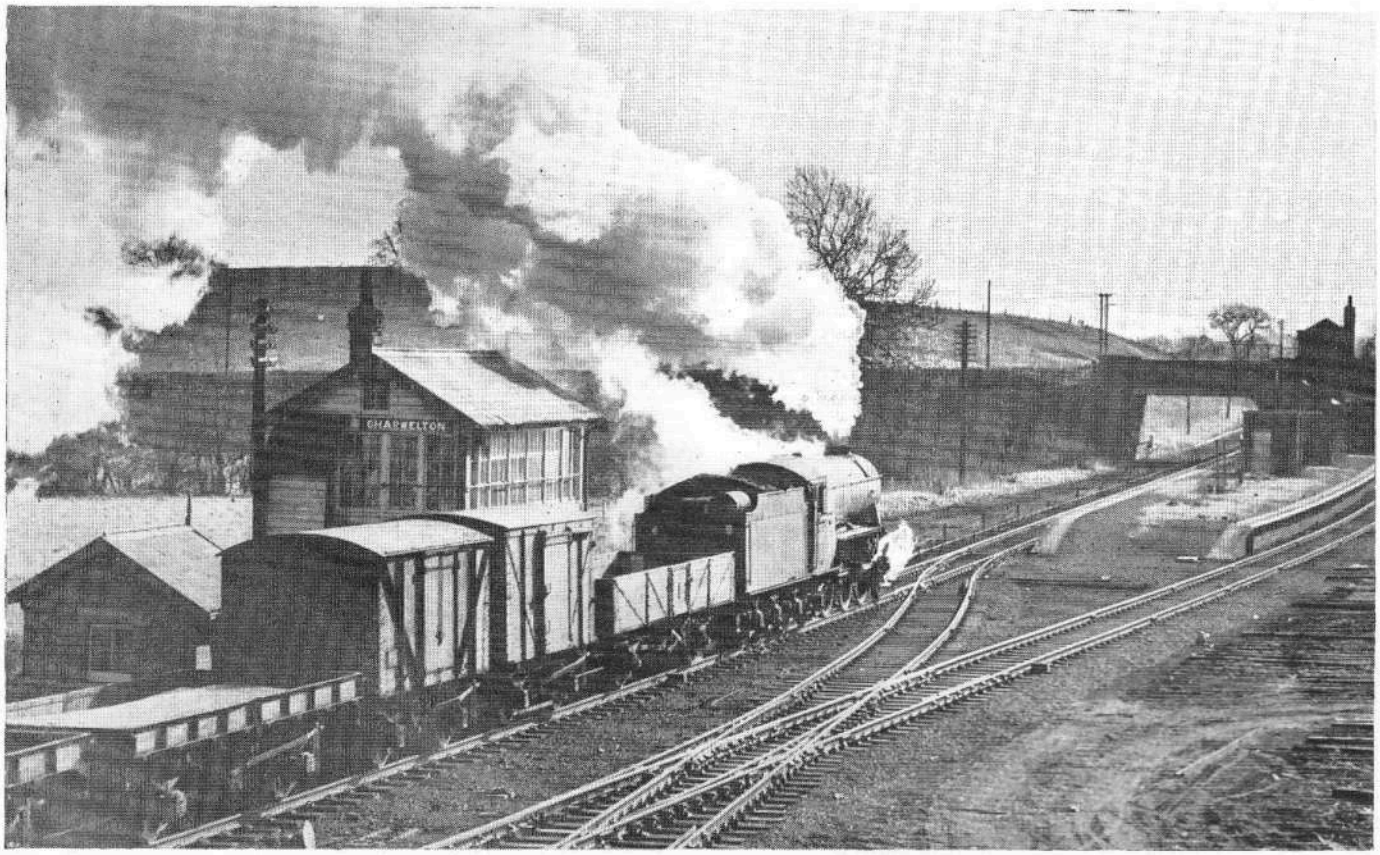
FOCUS
Concluded

Above left: "Jubilee" Class 4-6-0 No. 45653 *Barham* takes the West Coast main line out of Preston with an extra for Morecambe on June 8, 1964.
Photo by D. Ian Wood

Below left: The 15.45 Leeds City–Liverpool Lime Street, formed of a six-car "Trans-Pennine" diesel multiple-unit, passes Farnley Junction on its way out of Leeds on October 3, 1964.
Photo by M. Stephenson

Above right: SR Class U 2-6-0 No. 31802 shunts at Yeovil Pen Mill on September 6, 1964.
Photo by G. T. Robinson

Below: An English Electric Type 4 2,000 h.p. diesel-electric heads a southbound West Coast main line express from Carlisle near Oxenholme in September 1964.
Photo by W. J. V. Anderson



Through freight on this section of the GC line will soon be seen no more; Class V2 2-6-2 No. 60886 was photographed at Charwelton with a southbound goods on February 13, 1965.
Photo by G. T. Robinson

STAGE 2 OF THE GC CLOSURE IS SCHEDULED THIS MONTH

THE second stage of the reorganisation of Great Central line traffic is scheduled for the start of the next BR timetable on June 14. The first stage, the diversion of through merchandise traffic, was completed on March 1, as recorded in a report of the Bristol–Birmingham line freight dieselisation scheme in the April MODERN RAILWAYS. It involved a volume of about 470 wagons daily, mostly for South Wales and the South-West. Stage 2, the biggest step towards the eventual shutdown of the GC line, involves the re-routing of mineral traffic.

The final stage of the operation will be the diversion or abandonment of the remaining passenger services using the line, with the exception of the Nottingham–Rugby local service, which the previous Minister of Transport, Mr. Ernest Marples, ordered to be retained. No date has been forecast for this concluding step. It seems likely, however, that the passenger service proposals have already been submitted to the Ministry under Mr. Fraser's recently announced provision that he should have a prior and private sight of contentious closure schemes to forestall the costly rigmarole of statutory public announcement, objection and TUCC enquiry if the ultimate Ministerial decision seems certain to be a refusal.

Stage 2 involves the re-routing of traffic amounting to about 720 wagons a day. This is mainly coal from the East Midlands and South Yorkshire pits, which will be diverted to the Birmingham–Barnt Green–Bristol or the Banbury–London routes.

The new arrangements for GC line mineral traffic will add to the workload of Toton yard, but there is vacant capacity to absorb it. With or without the closure of the GC line, however, the traffic concerned would have had increasingly less need of yard processing as improved liaison with the NCB, the possibility of amalgamating flows from two or more collieries, further household coal concentration schemes and stricter operating disciplines within BR stimulated more block working. GC yards like Annesley and Woodford would have faced a gradual run-down in any event.

A key to the re-routing of GC traffic has been the commissioning of the Midland Line's second major diesel maintenance depot at Toton. The employment of diesel traction, combined with greater concentration of traffic, should improve train payloads and performance to an extent that will substantially mitigate the LMR's chronic staff shortage in the Midlands. This is most serious in the West Midlands and a good deal of criticism of the GC line closure plan has focused on the apparent futility of re-routing traffic into an area where train crews are in specially short supply. But there seems no valid reason, with diesel traction and a better standard of train performance, why the additional traffic cannot be worked out to and home from changeover points in the West Midlands by crews from districts not so seriously affected. The reverse of the coin is that the overall annual savings from the closure of the GC line and the absorption of its traffic by other routes are expected to total over £1½m.

LETTERS

Concluded from page 305

weekday services required 24 first-class Pullman cars in the sets of the "Master Cutler" (3), "Yorkshire Pullman" (5), "Tees-Tyne Pullman" (4), "White Rose" (4), and "Talisman" (8). But only 21 Metro-Cammell first-class cars were built in 1960–1. Therefore it has been physically impossible to maintain the Pullman services with new vehicles and old cars have had to be used.

The first up run of the Scottish "Talisman" set with Pullman cars (September 9, 1964) produced *Hercules*, *Aries* (1951 vehicles borrowed from the SR) and *Ione* (1928 car) and for the first down evening run *Nilar* (1928 car) was added at London to make up the rostered four cars.

When it is remembered that until June, 1964 the first-class patrons of the "Talisman" enjoyed the comfort of the ex-"Coronation" twin-first vehicles, with meals served at their seats Pullman-style, and from June to September, 1964 experienced the XP64 train set, they were certainly justified in complaining at the introduction of "Talisman" Pullman sections. Not only were first-class passengers forced to travel in vehicles of a bygone era, but they were faced additionally with the payment of a heavy supplementary fare. Apart from the poor public relations effect of this move, one might question the use of 1928 vehicles with non-roller bearing axleboxes on the Scottish "Talisman" weekday diagram of 880 miles daily. A BR decision to withdraw the older vehicles has now forced the cessation of the "Talisman" Pullman sections.

Durham. D. S. LOWTHER.

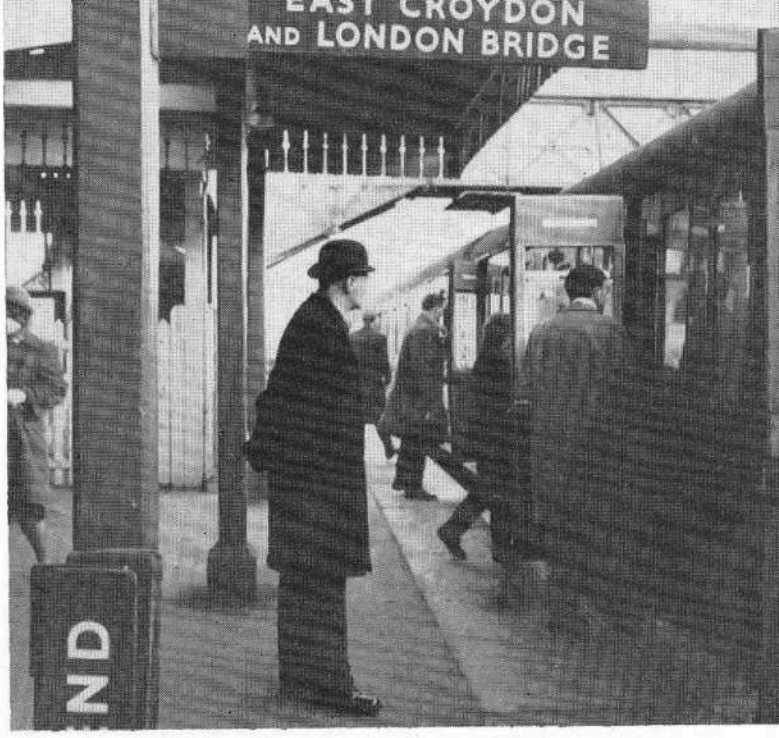
JUNE 1965

Joe Russell Area Manager

"Troubleshooter" the London papers dubbed Mr. Joseph (Joe) Russell when he was appointed the SR's first Area Manager last September. But the job has a more positive purpose—the creation of direct relations with the individual customer

Text by BRIAN HARESNAPE

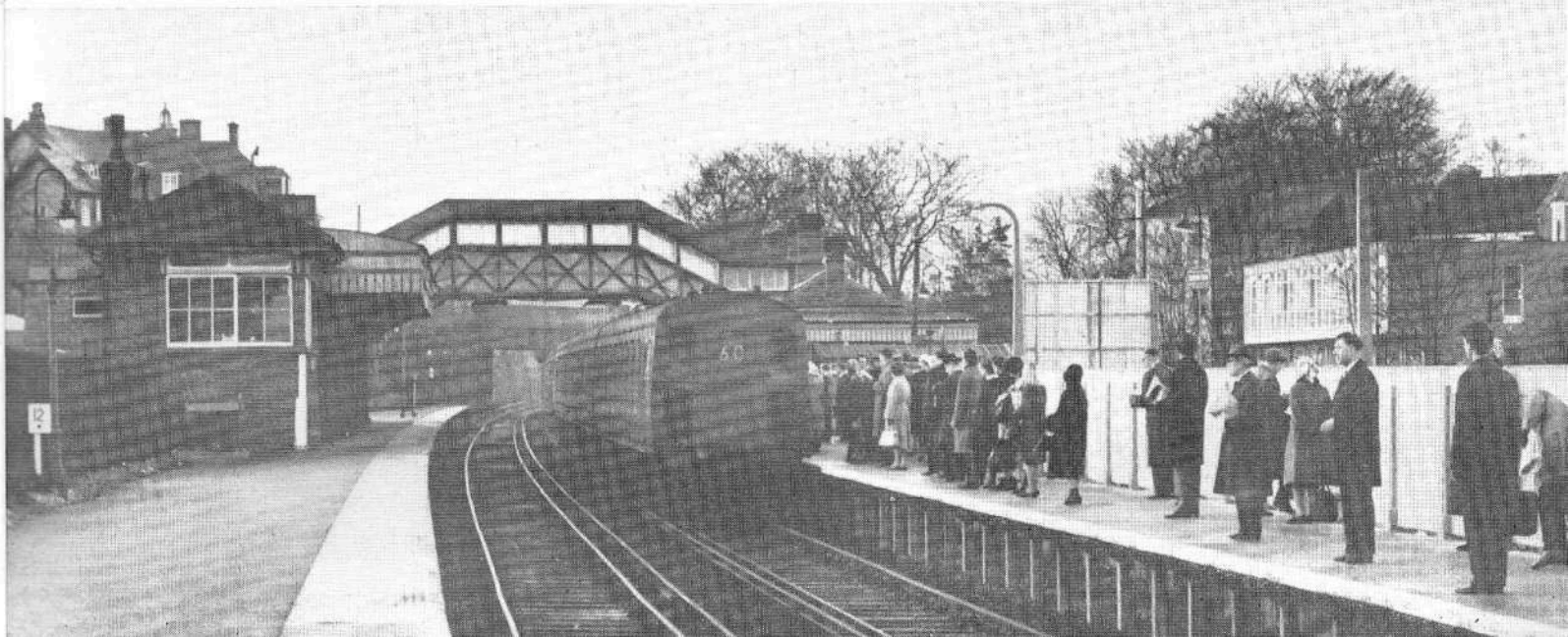
Photographs by COLIN GIFFORD

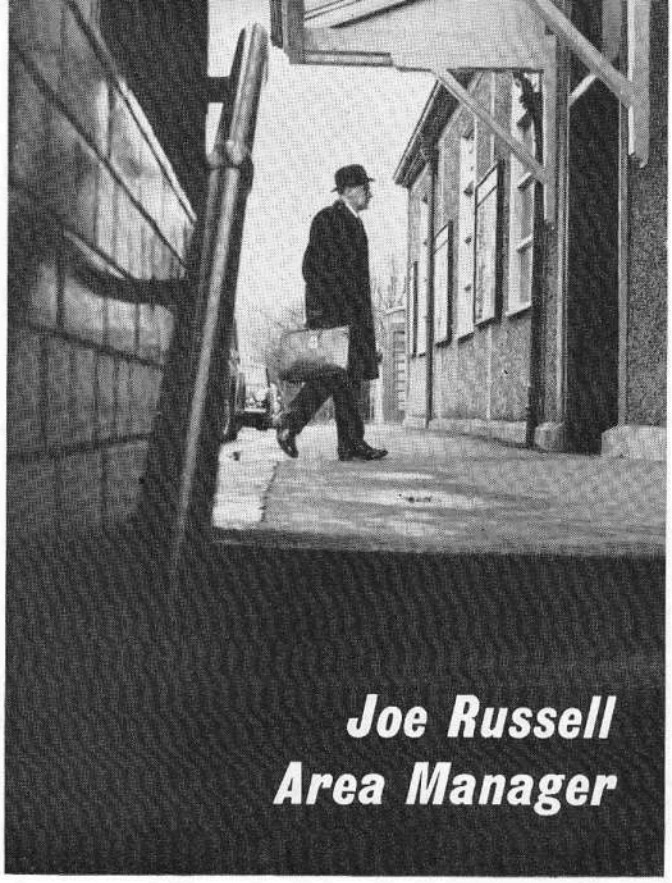


THE area under Joe Russell's management covers 17 stations on the Oxted lines, from Sanderstead (*seen on this page*) to Ashurst, Hurst Green to East Grinstead and Grange Road to Withyam—about 45 route miles. Russell's job—meeting passengers, tackling local problems and answering complaints—is to bring railway management into direct contact with the travelling public and other railway users, and to cut paperwork and red tape in customer relations to the minimum.

Very often a quick move on Russell's part can put local day-to-day complaints right. If on-the-spot efforts to sort out troubles get no results he can instigate a more thorough investigation. If it is a matter of policy he has access to Mr. George Weeden, the SR's Central Divisional Manager at Essex House, Croydon, at any reasonable time. In addition, he can go straight to the officers and assistants in charge of various aspects of railway operation and place the complaint or suggestion right in the lap of the person qualified to deal with it.

Passenger traffic is the mainstay of the Oxted lines. Local travel associations, such as the East Grinstead Travel Facilities Association, the East Surrey Transport Committee and the East Sussex Travellers' Association, are quite numerous in the area and regular meetings with their representatives keep Russell in close touch with passenger opinion. But he also spends a good deal of time travelling on the trains that serve his area—and at all times of the day, not just at peak periods—talking to passengers. Complaints of unpunctuality, lack of train heating, bad lighting, damage by vandals, and so on, are heard out patiently and courteously at first hand—and the customer is left with a conviction that he is not just a cipher in





Joe Russell
Area Manager

BR accounts. More often than not this conviction is later reinforced by evidence that something has been done to put his grievance right.

In a job of this nature personality counts for a great deal and Joe Russell's likeable manner greatly assists his frequent contacts with customers and staff. A sprightly 48, he joined the railway in 1939 and obviously enjoys his job still. Before taking up his new post he was stationmaster at Herne Hill and before that stationmaster at Blackheath.

Three station managers (formerly stationmasters) at Sanderstead, Oxted and East Grinstead come under Russell's control. Most staff matters are competently handled by these men and Russell says that it is unusual for complaints to be passed on to him. Staff shortage, in an area with attractive alternative employment, is a problem and good staff relations are considered very important.

As a pilot scheme Joe Russell's appointment has worked well. To what extent this is due to his personal aptitude it is difficult to say, but certainly this is an important factor. Future extensions of the scheme to other parts of the system will demand judicious staff selection. Another factor which cannot be over-emphasised is the importance of quick access to the Divisional Manager's office. Delays in obtaining directives on matters of policy could result in the Area Manager himself becoming ineffectual and merely a scapegoat. Fortunately there is no hint of such a situation on the SR and the go-ahead for further extensions of the scheme seems the obvious outcome of the experience gained on the Oxted lines.

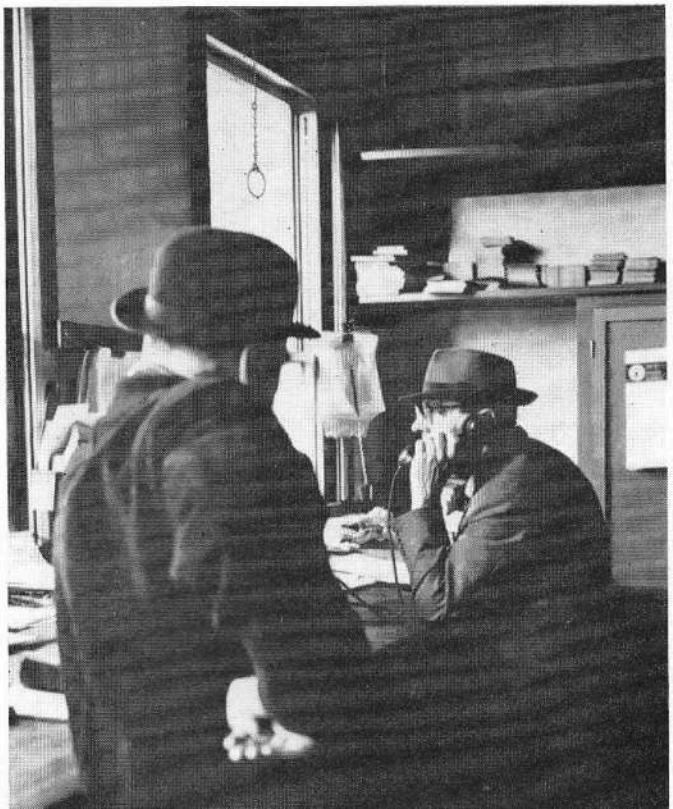
Commuter traffic, much of it coming to the stations by private car, is a major concern in the area that Russell manages. Often he starts his day mingling with London-bound commuters at one of his stations—such as Sanderstead—to find out their opinion of the service and perhaps pass on a considered answer to a question posed a day or two earlier. The reasons for any delays the previous evening can be explained.

Right: Chance for a more prolonged conversation comes on the train up to town. Problems of operating the service can be explained more fully and questions on all aspects of the service answered. Often solutions to passengers' complaints or suggestions can be hammered out on the spot.

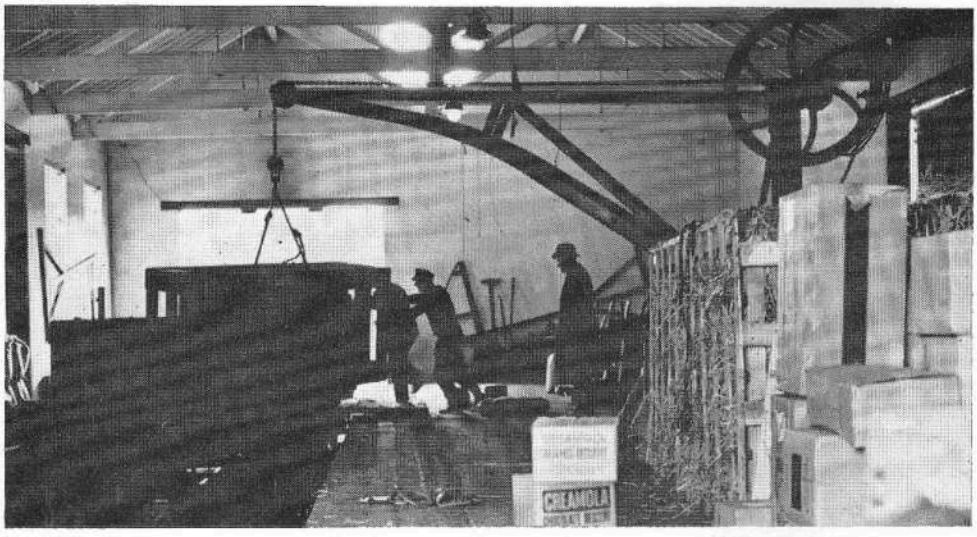
Right: At some intermediate stops Russell drops off the train for a word with the local station manager. Russell travels about 1,000 miles per month in the course of his work. If a passenger makes a specific complaint to the local station manager, Russell can arrange to be there next day to meet the passenger personally. He is seen here at Sanderstead.

Below right: Although he is certainly not desk-bound or burdened with paperwork, he has an office at Hurst Green station, where he can deal with local correspondence and telephone messages. Often Russell will travel to a customer's home or office to discuss face-to-face a complaint or problem they have raised.

Below left: Russell checks on a freight transit in the goods office at Oxted.

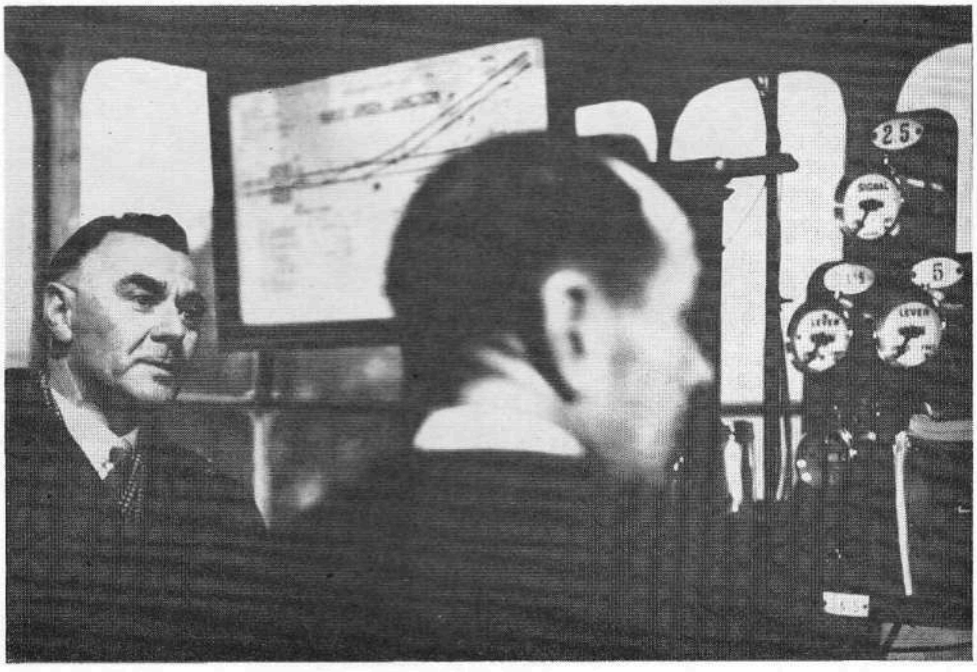


Above left: Direct contact with the local press and local travel association representatives makes for quick and effective local public relations.



Above and centre right: Freight traffic is not exceptionally heavy on the Oxted lines but it is one of Russell's important daily responsibilities. Local firms and traders—coal merchants, contractors and so on—are seen frequently to hear their needs. There is an almost daily flow of banana vans from Barry Docks, via Old Oak Common (WR) to a ripening store at Lingfield; and the efficient operation of this service is carefully supervised. Parcels traffic is also under Russell's watchful eye.

Below right: Staff relations are kept at a high level by regular visits and discussion. Russell makes a routine call on the signalman at Hurst Green Junction box to discuss the cause of a delay on the line earlier in the day.

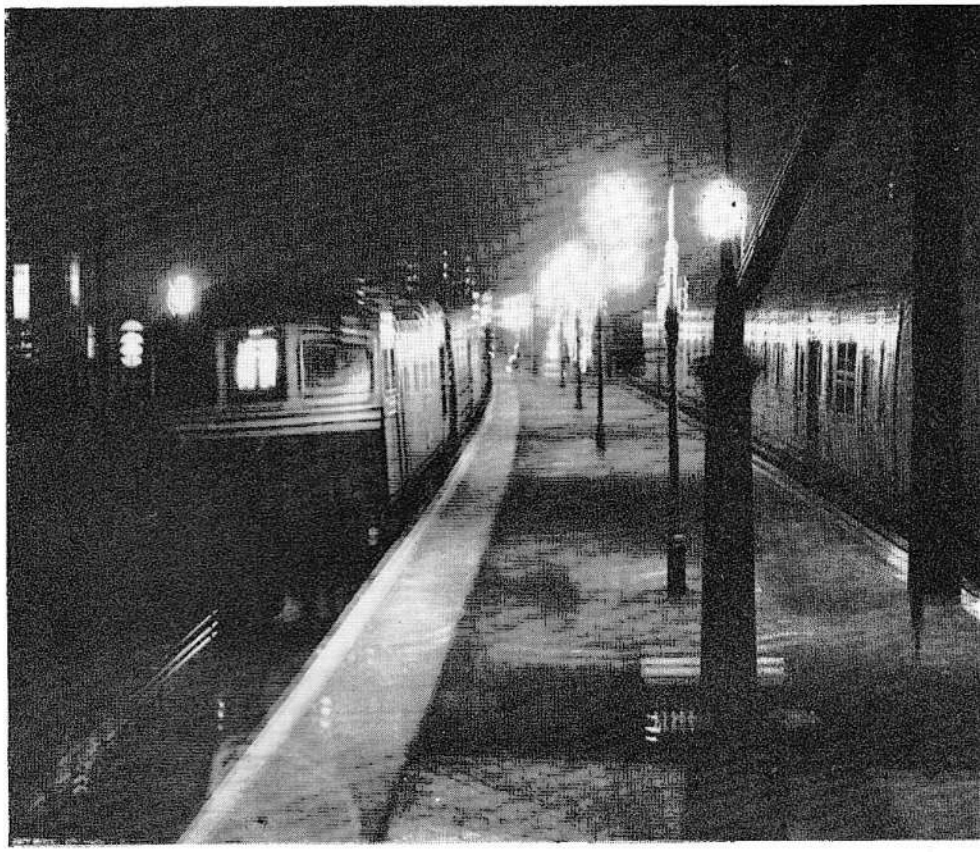


Joe Russell
Area Manager

CONCLUDED

Left and above: Russell reports direct to George Weeden, the Divisional Manager, at Essex House, Croydon, and has access to him at any reasonable time during the week. Each Friday morning sees Russell at Essex House for Weeden's morning conference and consultation with other Divisional officers. Often, the exchange is two-way and Russell is able to assist and advise on day-to-day operating of the Oxted lines.

Below: Homeward-bound passengers are usually too anxious to get home to the TV to stop and chat. Russell himself leaves the scene at last, wondering whether the next morning will bring a new crop of complaints and suggestions—or, as not infrequently happens, praise and encouragement.



Train Running and Traction Performance

Cecil J. Allen

AT a recent world conference on diesel locomotives and their performance, some figures were presented by the British representative which did not show up in the happiest light the diesel results that are being achieved at present in our own country. Although during 1964, on the basis of calculation that has been used until now, diesel availability had averaged 82 per cent, as compared with an availability of 79 per cent of steam locomotive power, the weakness of these figures was that if a locomotive was used at any time during the day, even for a short period only, it was regarded as available for the whole of the 24hr. The same method of calculation is used in Germany and other countries, but at the conference it was considered desirable that availability ought to be related more closely to demand. The motive power authorities of British Railways are considering, therefore, something in the nature of an hour-to-hour check on availability, in order to obtain a truer picture.

The actual British figures presented at the conference, in the form of a graph, were of four different Western Region diesel classes—the 2,200 h.p. "Warship" and 2,700 h.p. "Western" diesel-hydraulics, the Beyer-Peacock Hymek 1,700 h.p. diesel-hydraulics and the Brush-Sulzer 2,750 h.p. diesel-electrics. With 38, 74, 93 and 101 of these types respectively in WR service, a representative picture of average availability could thus be given. The other class concerning which the conference saw the record was the BR/Sulzer Type 4 of the Midland Lines of the London Midland Region, 10 units of 2,300 h.p. and 115 of 2,500 h.p. All the types concerned are, of course, largely engaged on express passenger service and it is when their availability percentages are sorted out from those of the lower-powered classes, such as the Type 1s engaged in shunting, whose availability is high, that such an average availability figure as 82 per cent for all classes is seen to be far from representing the true state of affairs with the higher-powered types.

The graph presented to the conference see-saws up and down, with very little consistency in the performance of most of the different classes. In the majority of cases the lowest levels were in the month of March, when the plague of train-heating boiler failures—which, of course, have no connection with traction failures—was at its worst. The poorest record of all was that of the BR/Sulzer Type 4s, whose availability has varied between 42 and 53 per cent and seems to have levelled out at about 50 per cent. As a result, the Midland Lines for a period based their locomotive diagrams on half the diesel stock available, in order to be certain that sufficient locomotives would be available to work each diagram, rather than attempting to rely on an unrealisable 80 to 90 per cent availability. Another type which has done badly has been the 2,700 h.p. "Western" diesel-hydraulics, which have suffered from torque-converter and bogie troubles; their availability rose to 65 per cent in February, 1964, but was as low as 43 per cent only in September and stabilised at about 60 per cent for little more than a month intermediately.

Good record of "Warships" and "Hymeks"

The Western "Warship" diesels, however, have done much better. They had a bad patch between February and March, 1964, with availability at one stage down to 58 per cent, but ran at between 70 and 80 per cent for almost all the rest of the year. Most consistent of all the performers have been the "Hymek" diesels; they began the year at 80 per cent availability and since then have remained consistently at between the 75 and 80 per cent level. Of all the classes, that with the most erratic record has been the Brush-Sulzer 2,750 h.p. Co-Cos. With the first few in service availability topped the 90 per cent mark, but since then their graph shows considerable fluctuations, with availability at the end of the year having dropped to between 70 and 75 per cent.

One of the reasons for the reduced availability percentage of this class has been that so many of them have had to be remitted from both the Western and Eastern Regions to Doncaster works for minor modifications. It should be added that the relatively good records of the Western Region "Warships" and "Hymeks" has been despite the action of the British Railways Board in compelling Swindon works to reduce its stock of spares, even down to such relatively inexpensive items as cylinder liners, which has resulted in locomotives being out of service for lengthy periods awaiting spare parts.

Reference to Western Region diesels directs attention to some interesting facts about their permissible loading, which is set out in Table I, and covers all the six different types that have been mentioned. In the table the "4-diamond" timings are the fastest in operation, apart from specially limited loads, such as that of the "Golden Hind"; the "3-diamond" timings are slightly easier. As will be seen, I have worked out the h.p. per ton available with each locomotive type to work the maximum loads tabulated at the scheduled speeds. The lowest figures, of course, represent the greatest competence on the part of the locomotive. On the fastest timings the variation as between the different types is considerable, from 7.45 h.p. per ton in the case of the English Electric Type 3s down to as little as 5.91 in that of the Brush-Sulzer Type 4s, but matters level out more on the "3-diamond" timings, with no greater range than between 5.14 and 5.83 h.p. per ton. However, in this case the Brush/Sulzer figure might have been lower were not 525 tons the maximum permissible WR passenger train loading with any type of locomotive. One point of interest in this table is that the 1,700 h.p. Hymeks are allowed to take heavier loads than the English Electric Type 3s, although the latter have the higher rating of 1,750 h.p.

Incidentally, the revolution that has been effected by the substitution of diesel for steam power on the most heavily-graded of the Western Region main lines has been quite remarkable. Westwards from Newton Abbot either a 2,750 h.p. Brush-Sulzer diesel or a "Western" may take 525 tare tons up the tremendous climbs to Dainton and Rattery, inclined at from 1 in 50 to a short length of 1 in 36, without assistance; a 2,500 h.p. BR/Sulzer Type 4 diesel may work 490 tons over the same grades and a 2,200 h.p. "Warship" up to 415 tons, a 1,700 h.p. Hymek up to 385 tons and a 1,750 h.p. English Electric up to 325 tons, the differentiation between these last two types being even more marked in these conditions. In the opposite direction the 2 miles at 1 in 42 from Plympton up to Hemerdon are the chief obstacles; here the 525 tons of the 2,750 and 2,700 h.p. units comes down to 515 tons, the "Peak" maximum to 465 tons; that of the "Warships" to 400 tons, of the Hymeks to 365 tons and of the English Electric 1,750 h.p. units to 325 tons. If my memory is not at fault, in steam days the limit over this section for "King" 4-6-0s was 385 tons and for "Castle" 4-6-0s 325 tons.

The standard schedule times laid down for "4-diamond" workings provide an interesting study; in all cases they represent the minimum, with no recovery margin for out-of-course delays, though they do, of course, allow for all

1 Western Region permissible diesel loading

Type	Class	H.P.	Maximum Loads			
			4-diamond timing		3-diamond timing	
			tons	h.p./ton	tons	h.p./ton
D15XX	Brush-Sulzer ...	2,750	465	5.91	525	5.27
D10XX	"Western" ...	2,700	420	6.43	525	5.14
D11-199	"Peak"	2,500	370	6.76	470	5.32
D8XX	"Warship" ...	2,200	330	6.67	420	5.24
D70XX	"Hymek"	1,700	260	6.54	325	5.23
D67XX	English Electric ...	1,750	235	7.45	300	5.83

2 WR PADDINGTON-BRISTOL

Locomotive: Type 4 Co-Co No. D1661 *North Star* (2,750 h.p.).
Load: 10 coaches, 333 tons tare, 350 tons gross.

Dist.		Sched.	Actual
miles		*min.*	*m. s.*
0.00	PADDINGTON	0	0 00
1.25	Westbourne Park ...	4	2 58
3.25	*Old Oak Common W. Jc.*...	—	5 09
5.70	Ealing	—	7 03
			†*sigs.*
9.10	SOUTHALL	11	10 22
13.25	West Drayton	—	13 45
18.45	SLOUGH	17½	17 10
24.25	Maidenhead	21½	20 57
27.90	*Shottesbrook*	—	23 17
31.00	Twyford	26	25 27
36.00	READING	30½	29 14
41.55	Pangbourne	—	33 27
44.75	Goring	—	35 44
48.45	Cholsey	—	38 05
53.10	DIDCOT	42½	41 06
56.50	Steventon	—	43 18
60.40	Wantage Road	—	45 48
63.80	Challow	—	48 00
66.50	Uffington	53½	49 46
71.50	Shrivenham	—	52 59
77.30	SWINDON	60½	56 48
			sig. stop
82.90	Wootton Bassett... ...	64	66 43
87.75	Dauntsey	—	70 18
93.95	CHIPPENHAM	74½	74 25
98.30	Corsham	—	77 29
101.85	Box	—	79 40
104.60	Bathampton	—	81 58
106.85	BATH	84½	*85 00
111.35	Saltford	—	90 48
113.75	Keynsham...	—	92 46
116.70	St. Annes Park	—	95 25
			sig. stop
118.35	BRISTOL	100	104 55

3 WR BRISTOL-PADDINGTON

Locomotive: Type 4 Co-Co No. D1662 *Isambard Kingdom Brunel* (2,750 h.p.).
Load: 10 coaches, 333 tons tare, 350 tons gross.

Dist.		Sched.	Actual
miles		*min.*	*m. s.*
0.00	BRISTOL	0	0 00
			sigs.
1.65	Stapleton Road	4½	6 05
			sigs.
2.75	Ashley Hill	—	8 10
3.90	Horfield	—	9 58
4.80	FILTON JUNC.	8	11 26
7.80	Winterbourne	—	15 08
10.55	*Westerleigh West Jc.*	—	17 27
13.10	Chipping Sodbury ...	—	19 31
17.65	BADMINTON	18½	22 59
23.40	Hullavington	—	26 51
27.90	Little Somerford ...	—	29 47
30.65	Brinkworth	—	31 34
34.75	Wootton Bassett ...	30	†34 46
40.35	SWINDON	34½	39 08
46.15	Shrivenham	—	42 57
51.15	Uffington	43½	46 07
53.85	Challow	—	47 50
57.25	Wantage Road	—	50 00
61.15	Steventon	—	52 32
64.55	DIDCOT	52½	54 44
69.20	Cholsey	—	57 44
72.90	Goring	—	60 07
76.10	Pangbourne	—	62 16
81.65	READING	66½	66 18
86.65	Twyford	70	69 52
93.40	Maidenhead	74½	74 26
			p.w.s.
99.20	SLOUGH	78	78 43
104.40	West Drayton	—	87 49
108.55	SOUTHALL	87	90 48
111.95	Ealing	—	93 11
114.40	*Old Oak Common W. Jc.* ...	—	95 04
116.40	Westbourne Park ...	95	*97 10
117.65	PADDINGTON	100	100 27

* Speed restriction, severe.
† Speed restriction, moderate.
‡ Recovery time (min.).

4 WR PADDINGTON-PLYMOUTH

Locomotive: Type 4 Co-Co No. D1044. (2,700 h.p.).
Load: 7 coaches, 240 tons tare, 250 tons gross.

Dist.		Sched.	Actual
miles		*min.*	*m. s.*
0.00	PADDINGTON	0	0 00
1.25	Westbourne Park ...	4	2 57
2.75	*Old Oak Common E.* ...	—	4 41
5.70	Ealing Broadway	(‡2)	7 12
9.10	SOUTHALL	12½	9 50
13.25	West Drayton	(‡2½)	12 55
			sig. stop
18.45	SLOUGH	21½ (‡2½)	23 55
24.25	Maidenhead	28 (‡1½)	30 28 †*sigs.*
31.00	Twyford	34 (‡1)	36 23
36.00	READING	39	*40 57
37.85	*Southcote Junc.*	—	*43 50
41.30	Theale	(‡1)	47 02
44.80	Aldermaston	—	49 42
53.10	NEWBURY	55½	56 18
58.50	Kintbury	—	60 24
61.55	Hungerford	—	†63 10
66.40	Bedwyn	66	67 14
70.10	SAVERNAKE	69½	†70 45
75.35	Pewsey	—	74 35
81.10	Patney	(‡4½)	78 23
86.90	Lavington	85½	82 45
94.55	*Heywood Road Junc.* ...	90½	88 03
97.00	*Fairwood Junc.*	92½	89 57
100.25	*Clink Road Junc.*	95	92 24
102.30	*Blatchbridge Junc.* ...	96½	93 57
108.25	*Brewham*	—	98 22
111.70	Bruton	—	101 01
115.15	Castle Cary	106½	†103 42
			p.w.s.
125.55	Somerton	—	115 41
134.75	Athelney	(‡3)	122 52
138.00	*Cogload*	—	125 16
142.75	TAUNTON	130	130 05
1.95	Norton Fitzwarren ...	—	3 34
7.10	Wellington	—	7 57
10.85	*Whiteball*	10½	11 26
15.95	Tiverton Junc.	—	15 33
18.15	Cullompton	—	17 23
22.35	Hele	(‡2½)	20 36
27.35	Stoke Canon	—	24 11
29.50	*Cowley Bridge Junc.* ...	29	26 08
30.75	EXETER	31	28 38
10.55	Dawlish Warren ...	10½	11 47
20.20	NEWTON ABBOT ...	25	24 52
			sig. stop
1.10	*Aller Junc.*	2	4 05
3.90	*Dainton*	6	8 19
8.70	Totnes	13	14 11
13.25	*Rattery*	19	21 25
15.55	*Brent*	21½	24 29
17.75	*Wrangaton*	—	27 31
21.05	*Ivybridge*	(‡4)	31 21
25.15	*Hemerdon*	36½	36 00
27.80	*Plympton*	—	38 36
30.35	*Lipson Junc.*	42½	42 05
31.85	PLYMOUTH	45	45 58

the permanent speed restrictions. Out of Paddington these times add up to 31½min to passing Reading, 36.0 miles; 44½min to Didcot, 53.1 miles; 63min to Swindon, 77.3 miles; 74½min to Chippenham, 93.95 miles; 84½min to passing Bath, 106.85 miles; and 98min to stopping at Bristol, 118.35 miles—a start-to-stop average of 72.5 m.p.h., with, let it be noted, a tare load up to 465 tons (about 13 bogie vehicles) in the case of a Brush-Sulzer 2,750 h.p. diesel. To a stop at Bath in the standard 85min would involve a start-to-stop average of 75.4 m.p.h.; the new 90min schedule of the "Bristolian" allows a 5min margin for recovering lost time.

New timings set 70 m.p.h. standard

Down the West of England main line the cumulative point-to-point times work out at 32min to Reading (allowing ½min for the slowing to take the divergence at Reading Main West Junction), 48½min to Newbury, 53.1 miles; 63½min to Savernake, 70.1 miles; 80½min to Heywood Road Junction, 94.55 miles; 96½min to Castle Cary, 115.15 miles; 117min to Taunton, 142.75 miles; 142½min to Exeter, 173.5 miles; 164½min to Newton Abbot, 193.7 miles; 178min to Totnes, 202.4 miles; and 207½min to Plymouth, 225.55 miles. All but the last are passing times; to a stop 1min must be added. This would mean 118min from Paddington to Taunton, start to stop; the new 123min schedule of the "Cornish Riviera Express" and the 14.30 down therefore includes a margin of no more than 5min over these minimum times, to allow for any out-of-course delays. The 153min of the 11.30 from Paddington to Exeter non-stop, however, allows 9½min margin. To Plymouth, if a non-stop run were made, a Brush-Sulzer 2,750 h.p. unit would be expected to run, again with a 465-ton train, in just under 3½hr, if no delays were experienced, or about 3hr 35min with a normal recovery allowance. It is astonishing, but quite heartening, that we have now reached the day when a net average of 73.1 m.p.h. is regarded as reasonable from Paddington to Exeter with a 465-ton train.

Incidentally, not long ago I received a letter from J. Hartley Rollin pointing out that the 2,750 h.p. Brush-Sulzer diesels appear to be rated for maximum speeds no higher than 95 m.p.h. "On the surface", he remarks, "there would appear to be some lack of foresight in designing locomotives to-day whose life is not likely to be less, say, than 25 years, and yet with a top speed of only 95 m.p.h. As we already have stretches of line over which 100 m.p.h. speeds are authorised, surely locomotives now leaving the shops should be capable, not only of this speed but of speeds well in excess of this figure, to enable them to take full advantage of the higher speed ceilings envisaged by British Railways in the not too distant future". This reminds me, by the way, that although, when one rides nowadays in any express out of or into Kings Cross that is "Deltic"-hauled, 100 m.p.h. is often reached on the stretches of line over which this speed is now authorised, London Midland Region electric drivers do not avail themselves as frequently of the similar authorisation between Rugby and Crewe. In the many logs that I have received from correspondents recently of runs over this stretch, maxima seldom are much over 90–95 m.p.h.

Brush Type 4s on the Bristol road

And now, by way of illustration, one or two runs with Brush-Sulzer Type 4s may be of interest. On the occasion of the official naming of two of the newest examples, Nos. D1661 *North Star* and No. D1662 *Isambard Kingdom Brunel* on March 20 last, a demonstration run was made from Paddington to Bristol and back, on 100min schedules each way, with No. D1661 going down and D1662 on the return journey. As far as Bath, the down schedule of 84½min exactly equalled the minimum standard time to which I have already referred (though with 2min less as far as Didcot—42½min for the 53.1 miles—and 2min more beyond), but with a tare load of 333 tons only as compared with the permissible maximum of 465 tons. For the logs of these journeys I am indebted to D. F. Johnson.

The down run is set out in Table 2. Unfortunately I am unable to print my correspondent's recorded speeds, as they do not seem entirely reliable. For example, those noted at Pangbourne, Goring, Cholsey, and Didcot were 84, 89, 96 and 92 m.p.h., whereas the average speeds over these three stretches work out at 83.5, 86.0, and 93.0 m.p.h. —a general average of 90.3 recorded as compared with 87.5 m.p.h. from the passing times. Also I find it difficult to credit the 100 m.p.h. claimed at or near Box, at the foot of the descent through the Box Tunnel, where the official speed limit is 75 m.p.h.

With the moderate 10-coach load, *North Star* found no difficulty in gaining time on the down journey. Needless to say, the first minute had been gained on the liberal 5min allowance to Westbourne Park, but this initial advantage was lost by a signal check from all but 80 down to 45 m.p.h. at Southall. From here there was one of two extremely rapid accelerations from checks that occurred on this run, speed having crossed the "80" line no further away from Southall than West Drayton, and averaging 92.2 m.p.h. from there to Shottesbrooke. After easings to 80 through Twyford and Reading, there came the speeds from Pangbourne to Goring already referred to, and then the striking feat of maintaining more than 90 m.p.h. all the way up the slight ascent from Didcot to Swindon; indeed, the average through from Pangbourne to Swindon, 35.75 miles, was as high as 91.9 m.p.h. By this time the special was 3¾min ahead of schedule; the net time over the 77.3 miles from Paddington to Swindon had been 55¾min.

Then came Nemesis, in the shape of a 25 m.p.h. check at Hay Lane and a dead stand for an intermediate block signal between there and Wootton Bassett, costing between them fully 6½min. From this check came the second lightning acceleration, with speed rising from just over 50 m.p.h. at Wootton Bassett to nearly 90 m.p.h. at the head of the 1 in 100 down to Dauntsey, that is, in no more than 3 miles of level track. From milepost 86 to Box an average of 90.6 m.p.h. was maintained, and when the special wound through Bath at the prescribed 30 m.p.h., it was only ½min late after having lost 7¼min by delays. That is to say: the 106.85 miles had been run in 78¾min net, at a start-to-pass average of 81.4 m.p.h. Troubles were not yet over, however; the last straw was a dead stand of 3½min for signals at North Somerset Junction, which with a permanent way slowing for a bridge under reconstruction cost yet another 6¼min and made the Temple Meads arrival 5min late. But deducting the total of 13½min lost by out-of-course checks, the net time had been 91½min for the 118.35 miles from London, which meant a start-to-stop average of 77.6 m.p.h. The fastest time I have ever known over this course was that of "Warship" diesel No. D805 *Benbow*, which on the inaugural run in 1959 of the "Bristolian" on its brief 100min schedule, covered the distance in 93min 48sec or 91min net, but with a lighter load of 280 tons tare and 300 tons gross.

93 m.p.h. average for 32½ miles

On the return journey (Table 3) *Isambard Kingdom Brunel*, travelling this way by the 117.65-mile Badminton route, achieved a net time almost identical with that of the down run. Coming up, the delays were chiefly at the start, for the train had to take the slow line from Temple Meads to Ashley Hill and cross to the fast line at a reduced speed of 15 m.p.h., in addition to the 15 m.p.h. over Dr. Days Bridge Junction. So, despite an acceleration to 40 m.p.h. up the 1 in 75 of Ashley Hill bank, Filton Junction was passed 3½min late; from there also the 10½min timing up the 1 in 300 to Badminton proved a little too tight and the lateness increased to 4½min. Speed was not allowed to rise much above 90 m.p.h. down the 1 in 300 from Badminton to Little Somerford, the average over the 7.25 miles from Hullavington being held to 92.2 m.p.h.; then, after the prescribed 60 m.p.h. slack over the junction at Wootton Bassett, the diesel settled down to a steady rate just above the 90 m.p.h. mark. Over the 32.55 miles from Swindon to Goring an average of 93.0 m.p.h. was maintained and then followed easings to about 80 for the curves at Pangbourne and Twyford, and also through Reading. After this, the 90 m.p.h. rate was reattained, but just before Slough came the reduction for a very bad permanent way slowing just beyond that station, to 15 m.p.h., costing at least 5½min. However, with a smart run into the terminus from Westbourne Park, cutting the 5min allowance to 3½min, the special came to a stand in Paddington a bare ½min late.

The 117.6 miles had been completed in 100min 27sec, or 91¾min net, but this also is not the fastest net time on record, for in 1959 "Warship" No. D804 *Avenger* ran a 7-coach train of 246 tons tare and 260 tons gross from Bristol to Paddington in 92min 52sec, or 87min net. This included speeds up to 102 m.p.h. at both Little Somerford and Wantage Road. Comparing the two runs tabulated, it becomes clear, I think, that equal time allowances are harder of observance on the up road via Badminton, despite the slightly shorter distance from Bristol, than on the down road via Bath, even with the 30 m.p.h. Bath slack and the slow run in from St. Annes Park. The explanation doubtless is the tortuous exit of the up trains to Stapleton Road, the 1 in 75 of Ashley Hill bank—2 miles of it—and the long 1 in 300 rise from Stoke Gifford until the summit has been passed at Badminton. But such runs as these show that the former "Bristolian" timing of 1¾hr between Paddington and Bristol should allow a comfortable margin, even with loads up to 11 or 12 bogies and including a 2min Bath stop, with a 2,750 h.p. diesel.

A "Golden Hind" run

As a companion to the two runs just described, I give in Table 4 details of a run from Paddington to Plymouth on the fastest train of the day, the "Golden Hind", timed by J. L. Lean. From the load point of view this train is a relatively easy proposition, with its limited formation of no more than seven coaches of 240 tons tare and 250 tons gross; as compared with the 130min allowed from Paddington to Taunton at the time of this run, reduced to 127min in the 1965 timetable, it will now be a different proposition altogether with the 10.30 and 11.30 down, which with their considerably heavier loads have to make the same run in 123 min, even conceding the fact that because of pathing difficulties in the evening rush hour the "Golden Hind" has to be allowed as much as 39min to clear Reading. However, the "Golden Hind" gets the tighter timing of the two west of Taunton—now 29min as compared with the 10.30's 33min on to Exeter, and 75min with both Newton Abbot and Totnes stops from Exeter to Plymouth as compared with 75min non-stop.

To come now to the running of the "Golden Hind", with a smart start 2½min had been gained by Southall, but this only resulted in two dead stops for signals between Langley and Slough, which made the train 2½min late past Maidenhead. After that there was one more slight signal check only, before Twyford, and by Reading the lateness had contracted to 2min. The schedule up the Kennet Valley is fairly tight and the "Golden Hind", having duly slowed to 60 m.p.h. through Hungerford and 56 round the Grafton curve, was still 1¼min down at Savernake. But the 4½min recovery allowance from here to Lavington soon put things right; actually the net schedule from Savernake to Heywood Road calls for an *average* of all but 89 m.p.h. between these points and was not kept by a matter of 48sec. From Lavington to Castle Cary the point-to-point times were being closely observed, with the

train from 2½ to 2¾min early, but this margin was swallowed up by a severe permanent way slowing at Keinton Mandeville; however, the stop at Taunton was effected punctually almost to the second.

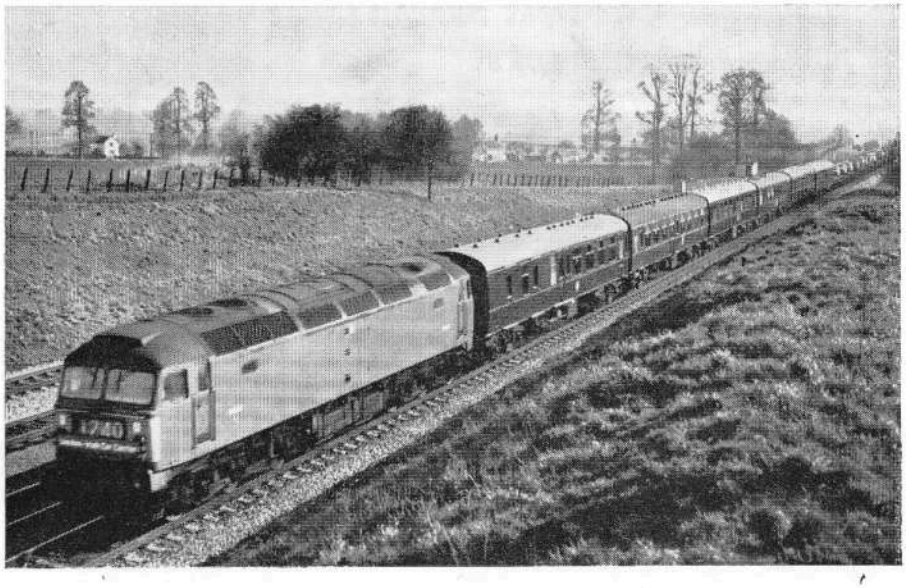
It is not easy to assess the net time on this run; had the net schedule, less recovery allowances, been worked to from Southall to Reading, the actual time would have been 12min less than it was, and equally that from Castle Cary to Taunton would have been 6min less, leaving a net from Paddington to Taunton of 112min for the 142.75 miles. But I should think that 113½ or 114min would be the more likely figure. Incidentally, it is worth noting that if all the recovery allowances be deducted, the net Paddington to Taunton schedule of the "Golden Hind" when this run was made *was* 112min.

The allowance of no more than 10½min from leaving Taunton up to Whiteball summit, 10.85 miles distant, is hardly generous, and *Western Duchess,* despite an average speed of 62 m.p.h. up the final mile of the 1 in 90–80 climb, dropped all but a minute here, but again with the help of 2½min "recovery" the 31min allowance from Taunton to Exeter was more than easily kept; indeed, the 31min booking was cut to 28min 38sec, just inside the new 29min allowance of the 1965–1966 timetable.

With its many service slacks, the run from Exeter to Newton Abbot was as usual featureless, but not so that onwards to Plymouth. Aller Junction was not ready for the express and stopped it momentarily, with the result that 2¼min was lost up to Dainton summit, breasted at 32 m.p.h. The scheduled average of 48.4 m.p.h. from Totnes up to Brent then proved too tight (and not surprisingly, perhaps, with 3 miles up mostly at about 1 in 50 to be climbed, and 1 in 90 after that for most of the way to Rattery); by Brent 3min had been dropped, including the Aller stop. Once again, however, a 4min "recovery" came to the rescue and Lipson Junction was passed ½min early. But the driver then saw fit to approach North Road at so funereal a pace as to come to stand a minute late—a slight anti-climax after the fine running to that point.

Incidentally, if the total 24½min of recovery allowances be deducted from this schedule, it leaves a net time, including Taunton, Exeter and Newton Abbot stops, of a mere ½min over 3½hr from Paddington to Plymouth. It is very clear from these lavish "recoveries" that the Western is determined that the "Golden Hind" shall keep time!

BR'S CHEAPEST CAR-CARRIER STARTS FOR IRISH TRAFFIC THIS MONTH



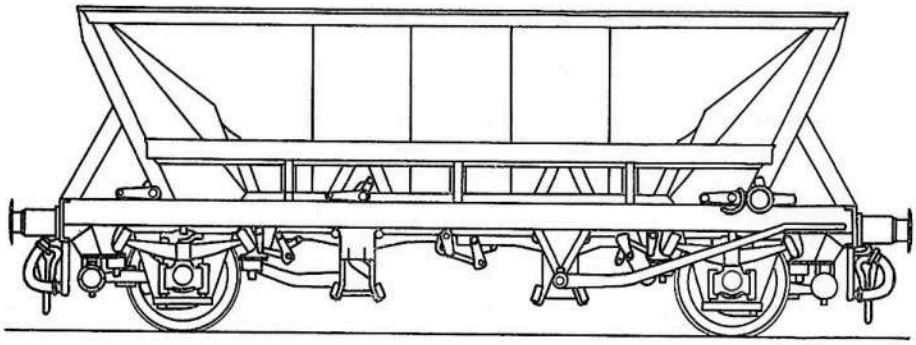
1

The Western Region's new London–Irish car-carrier, seen **(1)** on a March 31 demonstration run, is BR's cheapest service of the kind. A small family saloon, plus a car party of four, will be conveyed from Kensington Olympia to Fishguard and back, 522 miles, for an all-in rate of £18 (£10 for a single journey), the equivalent of 2d per mile fare for each passenger but with carriage of the car thrown in. For larger cars the rate is £22 and for big limousines £30. These rates are available as part of all through bookings to and from Rosslare via the drive-on, drive-off ferries with which the train connects at Fishguard **(2)**. The service starts at weekends only—out on Friday night and back on Saturday —from June 18, but it will run daily except Saturdays from July 11 to September 25. Outward, the train leaves Kensington Olympia at 23.55, so that its cars and passengers will be in Ireland by 10.15 next day; the return train will connect with the mid-day ferry from Rosslare and be back in London by 21.55. The passenger vehicles are compartment stock; each car party has the exclusive use of a reserved compartment and is provided with pillows and rugs. In addition, the train includes a buffet car **(3)**. The car-flats accommodate up to 28 cars. With handbrakes on, the cars are held in position by wedge-shaped chocks firmly fixed against each wheel and steel pins fasten the chocks to the decks of the rail vehicles **(4)**. This method has been proved completely secure at speed.

2

3

4



THE ER GETS READY FOR ITS FIRST MERRY-GO-ROUND

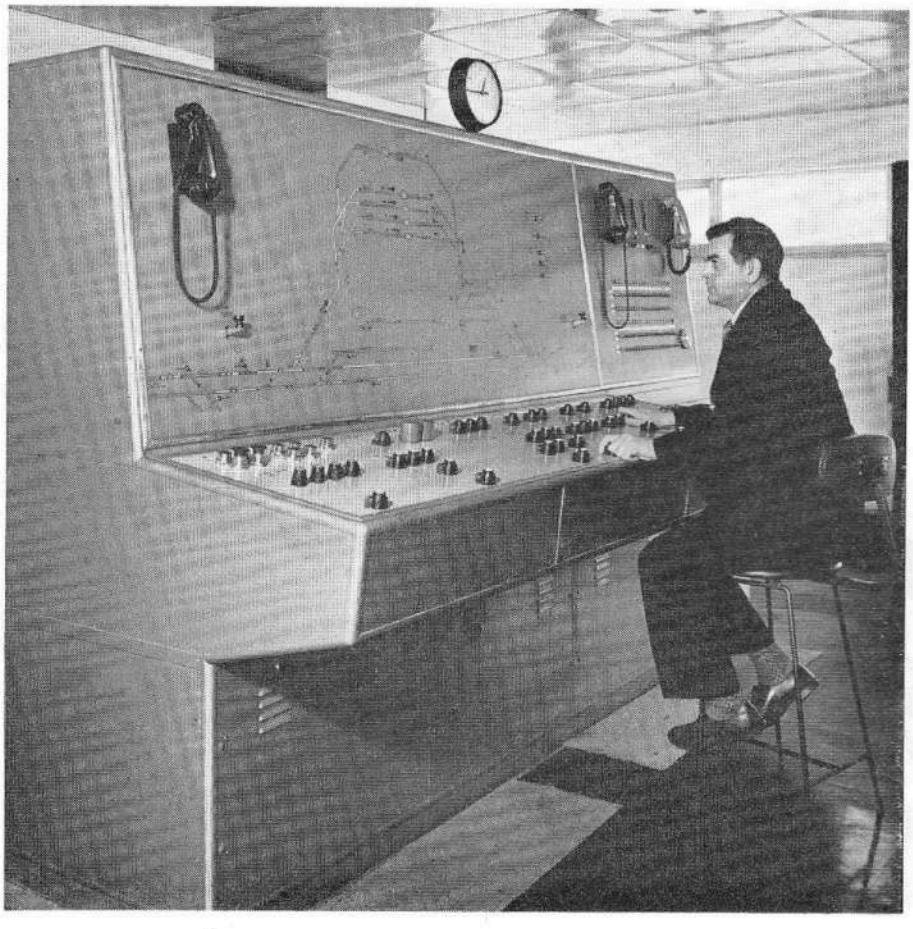
New signalling at West Burton takes in power station tracks

A NEW power-operated signalbox at West Burton, on the Retford–Gainsborough line, was recently brought into operation by the ER. This heralds the approaching completion of the CEGB's new power station at West Burton, which covers nearly a square mile of land alongside the track.

When fully commissioned, the 2,000 MW West Burton station, the largest coal-fired power station in Europe, will consume about 5m tons of coal and produce nearly a million tons of "fly ash".

The West Burton project is a testing ground for BR and CEGB development personnel, especially in regard to merry-go-round methods, which will be adopted in their classic form for the supply of this power station with coal.

West Burton fuel is expected to come from 14 collieries in the East Midlands and Yorkshire divisions of the NCB and ground stocking should start early this summer. In addition to bringing in coal, BR will move out about a million tons of fly ash each year to fill in old clay pits at Fletton, near Peterborough.



Intake over 100,000 tons weekly

When the power station is fully commissioned, it is envisaged that up to 112 trains a week, each carrying approximately 1,000 tons of coal, will shuttle between collieries and West Burton. Six Brush Type 4 2,750 h.p. diesel-electric locomotives will be required to work the coal trains.

Up to 24 trains a week will carry the fly ash to Fletton. Two 2,750 h.p. diesel-electric locomotives will take these 1,000-ton loads via Gainsborough, Lincoln, Spalding and Werrington.

Discrepancies in the working weeks of the concerns involved in the scheme have been overcome. Whilst the collieries work a five-day week, BR moves traffic on five-and-a-half days, while the power stations need supplies on all seven days. By arrangement with the CEGB, BR will work the coal trains into West Burton from approximately mid-day Monday until Saturday evening. The power station will then use its stocked supplies from Saturday night until Monday morning.

The coal will be conveyed in the new 18ft 3in-wheelbase, 32tons-capacity hopper wagons, of which current BR orders total 1,880. Galvanised interiors, rounded corners, improved valley angles and six bottom doors each extending nearly the whole width of the wagon combine in a major improvement of discharging techniques. The need for wagon shaking will be reduced to the bare minimum—it will be used only on exceptionally "sticky" or frozen coal and may in practice be eliminated altogether. The hopper wagons will be equipped with roller bearing axleboxes, hydraulic buffers and strengthened Instanter couplings. Air braking to full tare will allow a maximum loaded speed of 45 m.p.h. and of 50–55 m.p.h. when empty. An artist's impression of one of the new wagons appears at the head of the page.

The new wagons

As is already known, lineside equipment to engage fitments on the wagons for the automatic operation of the bottom doors and for the release and replacement of door safety catches will enable full trainloads to be discharged over the unloading hoppers whilst the trains are moving at a steady speed of 0.5 m.p.h. The special controls on the Brush Type 4s will keep their speed automatically governed to this level, despite a diminishing tail load, as discharge proceeds. (See also page 322.) The hopper capacity at West Burton is approximately 1,200 tons and the capacity of the belt clearing the hopper is to be 3,000 tons per hour. A train will be discharged at a rate of approximately 2,500 tons per hour.

The first of 1,880 32-ton hopper wagons is now being built at Shildon. The method of construction allows the removal of the top section, thus reducing

Above: An artist's impression of the new BR high-capacity, brake-fitted hopper wagon for merry-go-round workings.
Left: The operating console of the new West Burton signalbox. The oval layout in the power station area can be seen from the illuminated diagram above the console.

the height of wagons to facilitate their use at collieries where there is a height restriction. Capacity is then reduced to approximately 26 tons. In addition to the necessity to raise colliery screens, certain alterations in layout and longer weighbridge platforms will be required to handle the new wagons.

For the transport of fly ash a modified design of the Presflo wagon has been evolved. Fully air-braked, with strengthened Instanter couplings and roller bearing axleboxes, the 32–35 tons gross vehicles have been designed to carry 20 tons of fly ash. Trains of 46–48 wagons will be chute-loaded at West Burton power station and discharged pneumatically at Fletton. Discharge will be from one side of the wagon only and circular working at both points is therefore necessary to ensure the discharge valve is correctly positioned. When the fly ash is blown from the Presflos, water will be fed into the discharge pipes to produce a slurry which will then be pumped into the settling pits. This method, developed by the CEGB, will avoid the risk of the finely powdered ash being dispersed into the air. Each trainload will be discharged at Fletton in two rafts of 23–24 wagons. A circular layout for merry-go-round working of the fly ash trains has been built at Fletton.

Resignalling of station area

Electrically-operated colour-light signalling has been installed between Clarborough Junction and Trent Junction, Gainsborough, in connection with the new power station at West Burton. The scheme covers all BR lines and the internal power station lines leading to and from the coal and dust hoppers. All signals and points are operated from an individual switch control panel in the new signalbox alongside the main lines at West Burton.

Lines through the coal and dust hoppers will come under a CEGB controller located in the coal handling plant control building. He will operate a release switch to permit the signalman to admit a train into the hopper area. A switch is provided for each coal and dust track and the CEGB controller will decide into which track the arriving trains are to be routed. On arrival at the power station, a coal train can be routed through any one of these tracks, where it will drop coal, six wagons at a time, and then proceed back to the colliery, the engine and train remaining coupled throughout. Dust will be loaded in a similar manner.

All points worked from the new signalbox are electrically operated and five ground frames have been provided. Track circuiting between adjacent signalboxes has replaced block working and all reception and departure lines within the power station area are also track-circuited.

A second power station will be erected in the Eastern Region at nearby Cottam and this site will be rail-connected via the disused Clarborough Junction–Sykes Junction line. Access to the Cottam power station will be via Clarborough only. Together with traffic for West Burton, the Cottam traffic will approximately treble usage of the Retford–Gainsborough line. Increased line capacity will be made available by the £1m. Retford diveunder project, which is due for completion this summer.

The NCB and BR are also co-operating in a scheme for more efficient working and quicker transits from pits to power station. It is envisaged that permanently-coupled trains of up to 50 wagons could be loaded in about an hour by means of chutes from storage bunkers at the pits. The first of these, under fully automated operation, is to be brought into operation at the new Bevercotes (Notts.) colliery this summer.

NCB still baulks at cost

How quickly all the authentic merry-go-round schemes of the West Burton character that have been envisaged can be introduced is problematical. The NCB, as is well known, were no more than a spectre at the celebrations of the CEGB and BR over the 10-year contract for rail supply of coal to power stations. The Coal Board's reluctance to modify any of its existing pithead installations to suit merry-go-round working with the new high-capacity hopper wagons, unless the BRB foots the bill, has not been concealed. In the case of the Monkton Hall–Cockenzie circuit working, to be started by the Scottish Region next year, BR have had to grant the NCB a rebate on every ton of coal handled to secure the provision of suitable loading arrangements at Monkton Hall colliery. While the NCB is prepared to design the loading plant at new collieries to suit BR's merry-go-round working, as at Bevercotes, it is insisting that BR must finance alterations required at existing pits on the grounds that the massive appetite of many of the new power stations can only be satisfied by a number of collieries, and that in any event it is the railway which will derive the most profit from merry-go-round working.

NEWHAVEN CAR TERMINAL IS OPENED

THIS spring, as MODERN RAILWAYS has already described, has seen significant improvements in both the frequency and amenity of BR/SNCF cross-Channel services for the motorist. First was the official opening of Newhaven Car-Ferry Terminal on May 16, coincidentally with the maiden voyage of the first of the two new French car-ferries, the *Villandry*. Later will follow the second new French ship, the *Valençay*, and the new BR ship *Dover*, also the opening of a second car ramp at Boulogne Maritime. The existing ferries, augmented by the recently converted *Falaise* and *Normannia*, have emerged from their winter refit in the new colours of rail-blue, white and flame-red, although in deference to SNCF wishes the jointly-owned ships operating from Newhaven to Dieppe have a compromise livery which retains the traditional buff yellow funnel. This will also be applied to the new French ferries.

Experience with the *Falaise* since the ship's re-introduction last year has prompted BR to add a limited waiter service restaurant to the catering facilities. As MODERN RAILWAYS feared, some passengers either actively disliked self-service meals, which were the only kind available previously, or at any rate wanted more leisurely dining during the crossing. One wonders whether the *Lord Warden* would not be more suitably employed on the longer route from Newhaven, and the *Falaise*—ideally suited to quick service—on the Dover crossing. The chief objection is that the *Falaise* is a jointly owned vessel, whereas *Lord Warden* is wholly BR in ownership and operation. Another criticism of the *Falaise* has been the lack of cabin space or room to lie down during night crossings, or in heavy seas. Perhaps a solution to this complaint could be found in a design of seat either more fully reclining or else convertible into a simple form of bunk.

At Dieppe last-minute work is going on to resurface the road which carries the railway lines along the quayside from the Maritime to Ville station. This will be used by motorists wishing to continue their journey through France on one of the new car-sleeper trains to be introduced by the SNCF this summer. These car-sleepers will depart from Dieppe Ville station and a new office is under construction to deal with the traffic.

Widespread and compelling publicity preceding these innovations has made motorists fully conscious of British and French Railways' powerful competition for the booming cross-Channel car business (the publicity for the fleet as "Mini-Liners" has been a particularly successful gimmick) and bookings via Newhaven have been heavy to date. Morale of staff on both sides of the Channel is conspicuously high.

Introduction of roll-on, roll-off, ferries to the Newhaven–Dieppe service will allow a gradual withdrawal of the existing types of conventional passenger and cargo ships. The *Lisieux* will cease to run after the introduction of the second new French car-ferry, and this season the *Brighton* will work on regular services at weekends only. During the week it will be used for special traffic such as organised trips, etc. On the freight side a comprehensive freight handling scheme is in the process of development.

Stage one of the scheme will probably be introduced later this year; this deals with small-sized loads. Specially modified "Brute" trolleys will be used. These will be towed on or off the ships by tractors and on the British side will be loaded directly on to wagons in Newhaven–London circuit working. In the first instance London traffic only will be dealt with in this way (it constitutes some 50–60 per cent of the total); later on it is hoped to extend the scheme to the provinces. The chief obstacle to be overcome is the need for Customs examination facilities at inland destination points, though for London traffic this is available at Bricklayers Arms, to which the wagons will run from Newhaven under Customs seal. Larger railway traffic will be carried in containers and a new form of lift/carrier has been devised to load and unload the containers between train and ship. Freight traffic which comes to Newhaven by road includes loaded trailers and lorries, new vehicle chassis and caravans. Some of these are new traffic flows; some is old traffic lost and regained by the new service. A further developing traffic is the import and export of new motor vehicles, in particular private cars. This fluctuates according to the time of year (falling off badly just prior to the Motor Show, then reviving rapidly immediately afterwards). These vehicles are loaded on to the ships as and when space permits. Occasionally they have to await arrival of the necessary documents but delays are not frequent, or prolonged. The record for transit of a new car is just 11hr from the factory in the Midlands to delivery at Dieppe.

today and tomorrow

NATIONAL FREIGHT PLAN BEING DRAFTED BY BRB

A NATIONAL freight plan being devised by the operating department of the BRB is designed to improve the reliability of transits and to limit the amount of improvisation of services which now goes on every working day to cope with fluctuating traffic demands. As well as being conducive to unreliability, the present methods tend to under-utilise train crews and traction. The scheme now in evolution results largely from complaints by commercial officers of imperfect service. Basic to the BRB plan is a new approach to the freight train timetable. Hitherto this has been drafted from an analysis of traffic passing through yards and depots, with the frequent result that by the time the data has been processed and the timetable revised fresh traffic trends have invalidated the alterations. With the aid of new mathematical and computerised techniques, and using wagon consignment cards as the basic data, it is hoped to keep timetabling much more closely in step with traffic demands. The operators envisage a timetable in which the regularly scheduled trains will represent a little less than half the normal daily requirement. For the rest, the timetable will consist of conditional paths along routes of anticipated but more unpredictable demand. At main traffic centres a pool of common-user locomotives would be maintained with a reserve of engine crews who had been given a very wide route-training, so that trains could be organised at short notice by traffic controllers in any of the conditional paths where day-to-day demand required them. These conditional paths would be associated with conditional diagrams for the locomotives and men, to ensure the former's availability for scheduled maintenance and out-and-home workings, either to fixed staging points or to destination for the crews. The operators also see their proposals as a means to meet fluctuating demands for trains with a smaller staff that is static in number.

The Liner train go-ahead

Now that the Government has firmly endorsed the BRB's stand on free terminals for Liner trains (and presumably Roadrailer services as well), it is to be hoped that the NUR will not utterly forfeit the public sympathy it has traditionally enjoyed by persisting in non co-operation. It is an open secret that an increasing proportion of the union's executive has been privately convinced of the harsh facts of declining merchandise carryings by orthodox rail methods, the firm promise of a sizeable upturn in business if—but only if—terminals are open to all-comers, and the reasonableness of the BRB's final undertakings on redundancy. The positioning of the guard on the locomotive has injected an extraneous factor into the argument, since the BRB's view that in the long term guards can be dispensed with on most freight trains has been public knowledge for a long time; it seems to have been seized on by the NUR in the Liner train context as one issue at least that was likely to arouse some public sympathy. Otherwise the NUR objections to free terminals, in face of the concessions made by the BRB, have looked too obviously like the political dogma of a stubborn minority rather than a serious industrial argument. Unfortunately, until the more realistic majority of the union hierarchy can convert the dissidents to reason, none of the many customers who have already placed provisional Liner and Roadrailer train business are likely to commit themselves firmly to BR. BR are nevertheless going ahead with preparations for the first five services. By the end of April, 60 of the first 100 vehicles ordered had been delivered; construction of 300 containers was under way; and the first three terminals at London Maiden Lane, Manchester Longsight and Glasgow Gushetfaulds, were under construction at a combined cost of £320,000, excluding the Drott cranes. The Liverpool depot is to be at Garston. The BRB hopes to have all the first five Liner train routes operational by the end of the year.

London survey kept under wraps

For reasons not clearly established—though it is rumoured that the Government demanded further study of the very high costs envisaged—the last of the Beeching reports has not yet emerged. This is the survey of the London rail network, above and below ground, which the BRB and LT have prepared jointly and which was originally expected to appear in late March. Like the BR trunk route survey, it examines the system capacity in relation to forecast future demand. The main proposals are likely to embody new LT lines and extensions, but there is some evidence that a few startling suggestions affecting BR surface traffic may also be contained in the document—notably a merger of Kings Cross and St. Pancras, as the latter's traffic will decline if the trunk route survey's plans to concentrate a good deal of its trunk passenger traffic on the West Coast main line are fulfilled. The LT schemes are likely to be those already advocated in public by LT officers and once more discussed by Mr. Anthony Bull after his recent appointment to succeed Mr. A. H. Grainger as the Board's Vice-Chairman. One is the new Fleet Line, to run from Baker Street via Bond Street, Trafalgar Square, Fleet Street and Cannon Street to the south-eastern suburbs; others are extension of the Aldwych line to Waterloo and of the new Victoria line to Brixton. It is possible, too, that a take-over by the LT of certain SR inner suburban services will be advocated, to release main-line capacity for more intensive working to and from the outer suburban and coastal commuter areas.

BR productivity up 26 per cent

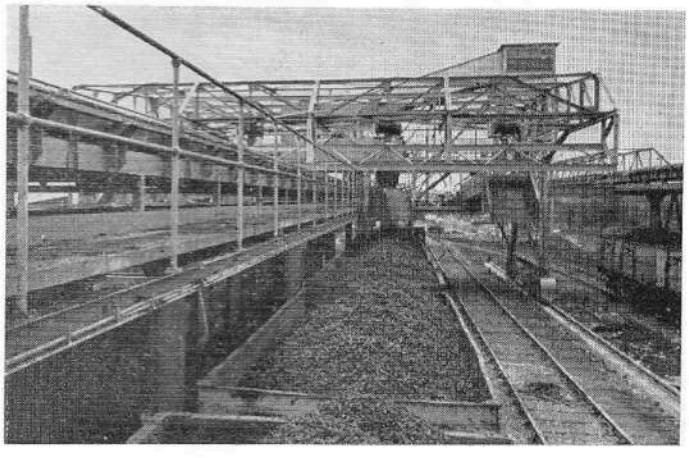
Expectation that the BR deficit will be substantially cut again this year was voiced by Dr. Beeching in a speech to the Birmingham Chamber of Commerce on April 14. Recalling that it had been cut by £22m in 1963 and £14m in 1964, he predicted that it would come down "by a similar amount" this year. Remarking that over the past three years BR manpower had been reduced by 104,000, Dr. Beeching said that this was equivalent to an addition of about £100m per annum to the gross national product, as it was reasonable to suppose that each displaced man was capable of producing an average of £1,000. He added that productivity on the railways had risen by 26 to 28 per cent in relation to a wage rate rise of 26 per cent, with a result that BR staff individually were getting a much better reward.

Timetables to last until April 1966

Despite the continuing likelihood of intermittent service changes as a result of closures or modernisation developments, BR are persisting with their plan for timetables of a year's duration. The new timetables coming into force on June 14 will be current until April 17, 1966, which suggests that April will in future be the period for the annual introduction of new schedules.

LMR Line organisation to go

The LMR is embarking on another administrative reorganisation. The number of Traffic Divisions is to be reduced from eleven to seven—London, Birmingham, Stoke, Liverpool, Manchester, Preston and Nottingham. At the same time, the Line management level, which is intermediate between Region and Division, will be progressively reduced to the point of elimination. The Region's civil engineering will, by a series of



The travelling gantry loader at the NCB's new Daw Mill colliery, which loads wagons on any of the four tracks it spans, permitting use by BR of permanently-coupled wagon formations *(see facing page).*

moves, be brought territorially into line with the seven traffic divisions; there will be seven Divisional Engineers to replace the existing 14 civil engineering districts. The new engineering divisions will often be located in the same town and in the same office as the Traffic Division Manager. The present set-up of Divisional Signal Engineers and area assistants will be replaced by one in which the whole of the Region is covered by four Divisional Signal Engineers only. This two-tier organisation, in which traffic and engineering functions will share common boundaries, is expected to take about two years to develop. It will achieve a considerable reduction of administrative staff.

Simplifying signalling

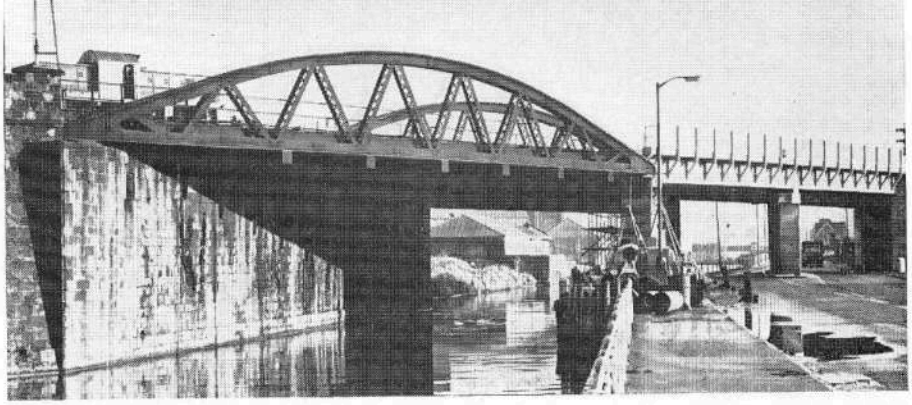
Power signalling must be far less complex if future resignalling schemes are to be justified on cost, Mr. H. C. Johnson, Chairman and General Manager of the LMR, told the Institution of Railway Signal Engineers at their recent annual dinner. The signalmen's wages saved by a new power installation and improved traffic operation achieved by centralised control were important factors, but still it was not easy to justify the cost of resignalling. Mr. Johnson contended that signal engineers provided too readily the facilities demanded by the operators; in future, he said, signal engineers should challenge them to simplify track layouts. Signalling costs for an additional set of points must be weighed against the operating advantages and the question asked: "Will these points really be needed?" Everyone was far too conservative and there should be a greater exchange of ideas between operators and engineers with the aim of simplifying signalling. To signalling contractors, Mr. Johnson said that their biggest competitor was not the firm next door but costs. Simplification of maintenance needs was particularly essential; it was no use saving signalmen's positions if a similar number of additional maintenance men were needed instead. There would be quite a lot of British Railways left after rationalisation was complete and much of it would need resignalling, but this could only be done if the price were right.

New Midlands colliery fitted for latest BR techniques

Loading methods of a new kind are a feature of the NCB's Daw Mill colliery, near Coleshill (Warwicks), which has recently begun production. Four of six loading tracks are spanned by a 57ft-wide travelling gantry, which is fed by a 3ft-wide conveyor belt from the pit's preparation plant. The belt moves at 300ft per minute to pass 200 tons of coal an hour to the gantry, from which wagons on any of the four tracks can be loaded through discharge outlets. This arrangement will allow BR to employ permanently-coupled trains to despatch the coal from Daw Mill. Initially, the colliery is despatching three block trains daily, two for the GECB power station at Hams Hall and one to London and the South-East, but the flow will build up to a rate of more than 500,000 tons annually. The rail layout embodies two reception sidings of 100 wagons total capacity, seven sorting sidings with 350 wagons total capacity and six loading sidings.

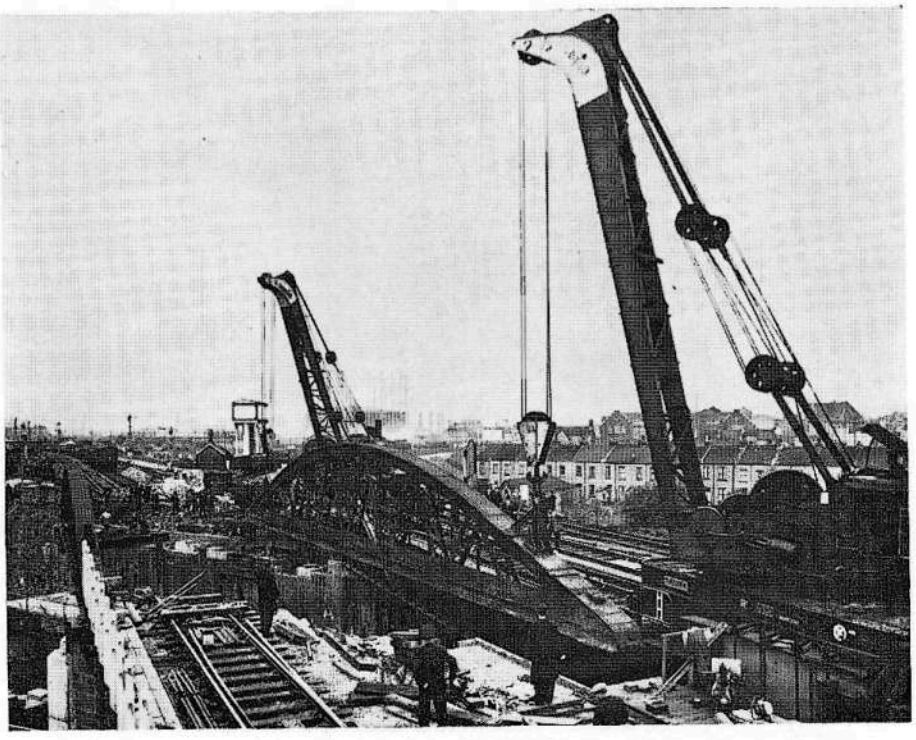
New station for Burnley

Stage one of the modernisation of Burnley Central station—the demolition

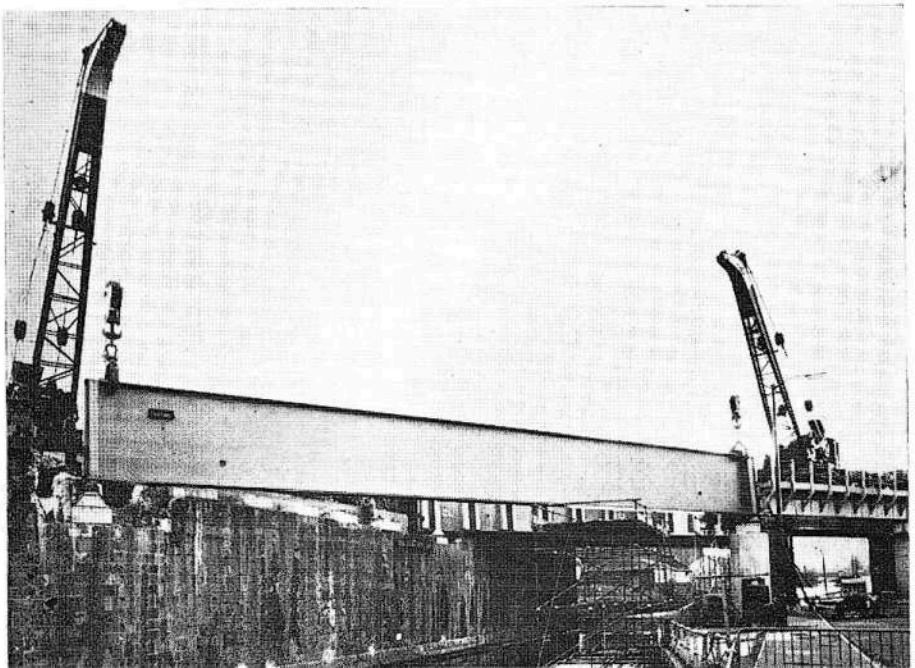


80-YEARS-OLD BRISTOL BRIDGE RENEWED

Over the Easter weekend, WR civil engineers replaced the main-line bridge of 1880 build over Feeder Canal at North Somerset Junction, about half a mile from Bristol Temple Meads station. Work started at 23.00 on April 15 and ended at 16.00 on April 19, just before the homeward rush at the end of the holiday weekend. During the period in which the London main line was closed, trains from Bath and beyond reached Temple Meads via the Bristol avoiding line to the west end of the station, then reversing into the platforms. Trains for Bath and beyond took the South Wales line as far as Dr. Day's Bridge Junction and reversed over the north-to-east spur of the triangle to gain the Bath route.



The new bridge was designed and constructed in units of mild steel plate, some of which weighed over 40 tons. The units were prefabricated and, as seen in these illustrations, were positioned by BR cranes.



of existing platform buildings and the conversion of the remainder as temporary accommodation to cater for the needs of passengers and railway staff—is complete. In the main, all the buildings on the Preston side of the entrance to the up platform have been demolished, including the booking office, stationmaster's office and part of the parcels office. In addition, some work has been done at the cattle dock to make provision for a future entrance for parcels traffic. In its new form, Burnley Central will be a two-storey structure, with the ground floor at street level and the first floor at platform level. The booking hall and toilets will be on the ground floor. On the first floor, platform buildings will include waiting rooms and new offices for the stationmaster and his staff, together with a new parcels office and left luggage office.

Future services north and west of Shrewsbury

There is no foreseeable intention to end services from Shrewsbury to Aberystwyth and beyond or over the ex-GW main line from Shrewsbury to Wrexham, Ruabon and Chester. This was stressed by Mr. A. E. T. Griffiths, Chester's new Divisional Manager, during April, though he pointed out that the future pattern of the remaining services in the Division was largely dependent on the degree of public support for them. In this summer's timetable services from Shrewsbury to Aberystwyth were being accelerated by 30 to 40min overall following the closure of some intermediate stations and as a result of this and good connections at Shrewsbury it would be possible for the first time to make a day return trip from Aberystwyth to London. With the introduction of the full LMR electric service in the West Midlands in the spring of 1967, there would be no direct services between London and Shrewsbury, Wrexham, Chester and Birkenhead, except for one morning up and evening down through portion between Shrewsbury and Euston. Instead, there would be a two-hourly service from Chester via Shrewsbury to Wolverhampton in connection with Euston electric trains, and an hourly service between Shrewsbury and Wolverhampton. Mr. Griffiths said there was a possibility of some Aberystwyth–Shrewsbury diesel trains being projected to Wolverhampton to link with the electric service to and from London.

Fewer m.u. workings in the West Country

Commencing with the summer service, nearly all trains between Penzance and Plymouth will be locomotive-hauled, displacing diesel multiple-units which are to be drafted to other employment. All long-distance trains between Penzance and Plymouth are now to call at the ten principal intermediate stations—St. Erth, Hayle, Camborne, Redruth, Truro, St. Austell, Par, Bodmin Road, Liskeard and Saltash; the schedules have been tightened up to minimise the effect of extra stops and the WR claims that the service has been better spaced throughout the day. In response to a number of requests, the "Golden Hind" is to call at Totnes in both directions, but again intermediate acceleration will avoid any extension of the overall schedule to cover this new call. Among other changes not mentioned in last month's review of the new WR timetable is that the "Devonian" conveys a through Plymouth portion in both directions. Some cross-country connections have been improved, among them those between the WR main line west of Taunton and Weymouth via Yeovil for the Channel Islands, and with Devon and Southern Ireland by a connection at Newport off the 6.35 Plymouth–Manchester with the Fishguard Harbour boat train. On former SR routes in the West Country, the stopping services between Salisbury, Exeter and North Devon and North Cornwall have been re-arranged to allow more flexible programming of the diesel multiple-units, chiefly to improve their timekeeping. Services between Bude and Exeter have been replanned with connections for Tavistock and Plymouth at Okehampton and for Wadebridge at Halwill.

No "Deltic" for the WR

In pursuance of its quest for locomotives of higher horsepower to achieve the city-to-city express passenger speeds it deems essential, the WR was hoping to carry out further high-speed trials in May. It was planned to borrow a 3,300 h.p. "Deltic" diesel-electric from the East Coast route for a day to run from Paddington to Plymouth and back, but it is understood that one cannot be made available. It is reported that the WR may employ pairs of English Electric 1,750 h.p. Type 3s on some of its accelerated West of England and South Wales services this summer.

One station for Reading

The WR takeover of the control of Reading Southern station from March 1, reported in the April MODERN RAILWAYS, has a wider significance. The intention is to divert SR traffic into Reading General and close Reading Southern station later this year. The re-routing of SR traffic requires a new electrified connection that will bridge a road at the approach to Reading General and although this has been approved by Reading Town Council, it was still awaiting parliamentary authority at the end of April. Redevelopment plans for the site of Reading Southern station have so far been rejected by the Reading Town Planning Committee. Meanwhile, work has started on the preparation of Reading General to accommodate the SR traffic. A local correspondent writes that this involves insetting a bay on the inner side of the south end of the down main platform, No. 4. This will take eight coaches and cater for the electric trains to and from Waterloo. The Guildford line trains will use existing platforms in Reading General; since the beginning of April one mid-day SR parcels train has already begun to operate from the ex-GWR station. Traffic between the SR lines and the existing platforms at Reading General is already provided for. It is planned to have the full £250,000 scheme in operation by next September. Meanwhile, Reading General station is being modernised and prepared for its new role. Already a new booking hall has been built and an enlarged mechanised ticket office brought into use; this has a reserve capacity to take over the tickets now issued at the South station.

New station for Stevenage

Stevenage, Herts, on the GN main line from Kings Cross, it to have a new station nearer Stevenage New Town. This was first proposed in conjunction with the deferred scheme for GN suburban electrification, but it is now to go ahead as an independent project. The chosen site is about a mile to the south of the existing station and it will be served by a footpath from the town centre and a subway under the old A1 main road. The design and commencing date for the new station has yet to be agreed, but it will probably be of two-island platform pattern, with a subway or bridge from a booking office on the east side of the line.

New SR cheap fare policy?

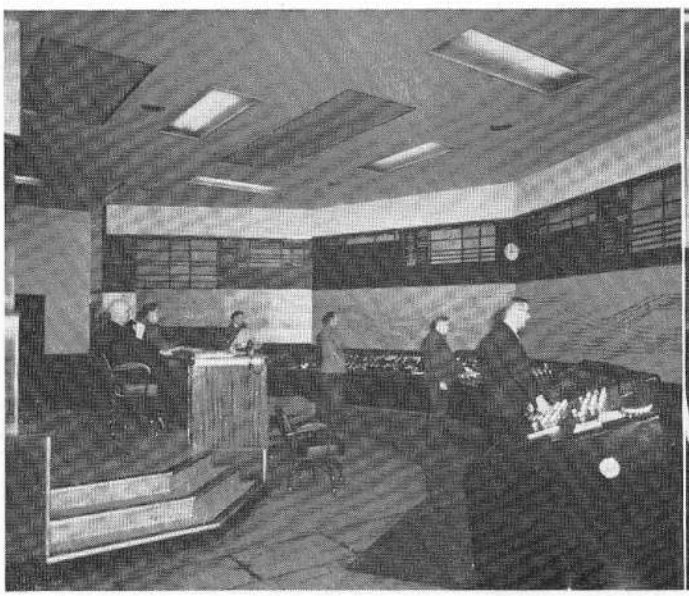
Extension of cheap day and off-peak day return fares to travel throughout most of the Region is understood to be the SR plan from the start of the new timetables on June 14. According to unverified reports, this Region-wide standardisation would abolish some of the present cheap fare offers on selected routes and apply a common mileage rate to all regular reduced fares, so that some existing cheap fares will probably be increased. On the other hand, a large number of disconcerting anomalies might be eradicated and from a great many stations there would be a far wider range of cheap-fare inducements than hitherto. Outside the London area, it is suggested, cheap day returns will be available on all trains from all stations. The scale of the cheap day fares is predicted to be very little in excess of the ordinary single fare. An official announcement is expected at the beginning of June.

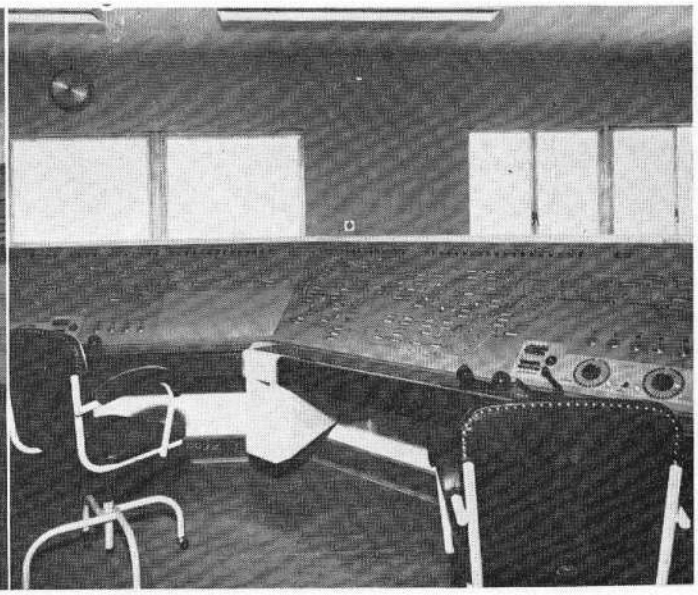
Hastings branch singling

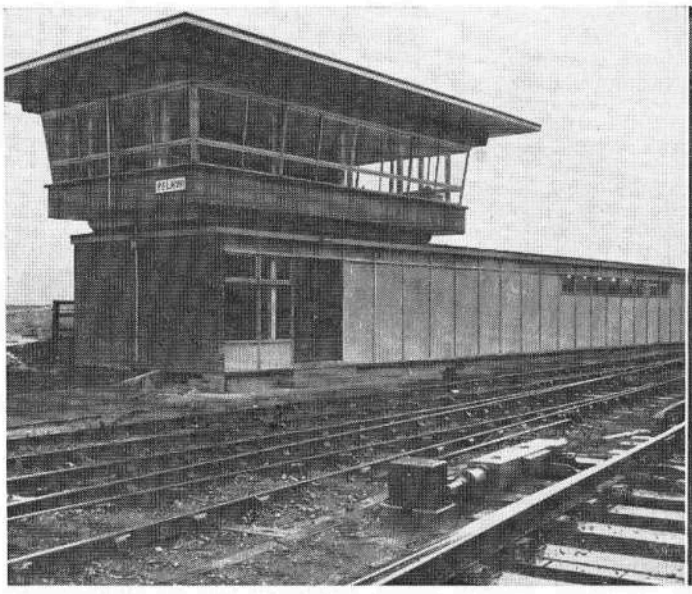
The SR is to single-track the Ashford–Hastings branch between Appledore and Ore. This is announced as a "final bid to cut costs and save the line from closure". The train service will be revised to suit in this summer's timetable.

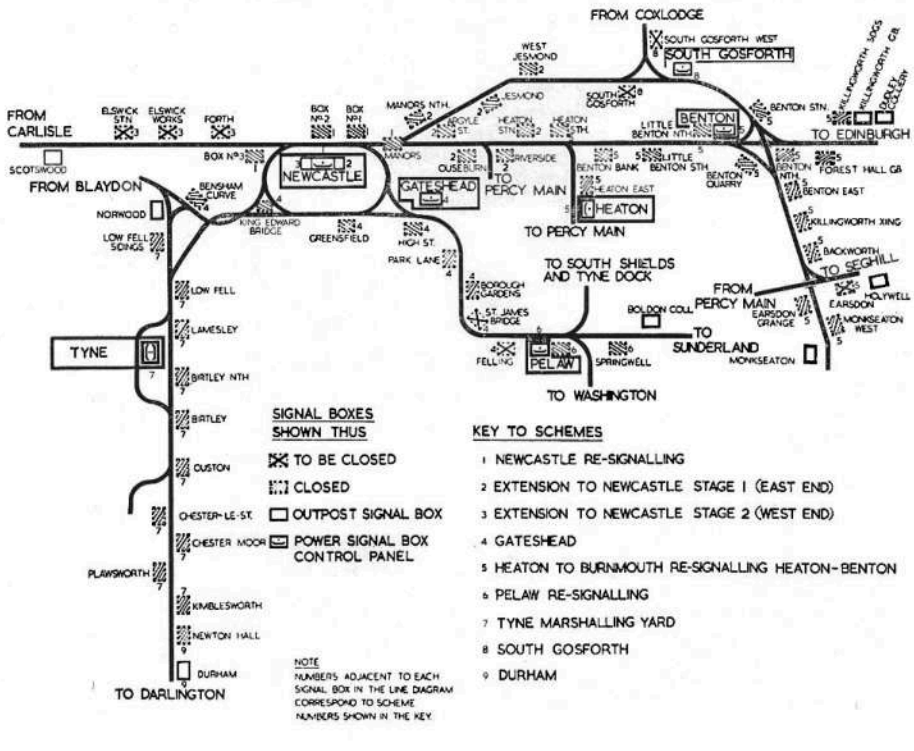
Signalling modernisation in the Newcastle area

Over the past six years, the signalling in the Newcastle Division of the NER has been extensively modernised and rationalised, combining essential renewal of life-expired equipment with an increase of line capacity and the need to serve new installations and remodelled layouts. In all, 44 manually-operated signalboxes have already been closed and economies are continuing. The basis of the scheme has been the concentration of control on strategically-sited power signalboxes at Newcastle Central, Gateshead, Heaton, Benton, Pelaw, Tyne marshalling yard and the Tyneside Central freight depot. The biggest of these installations is Newcastle Central, which was commissioned in 1959. Initially, it displaced four signalboxes with a total of 538 levers, but provision was made for extension of its territory towards Scotswood in the west and Heaton and South Gosforth in the east. The eastward extension was brought into operation in February, 1964, when eight route-miles were brought under the control of the Newcastle box and seven mechanical boxes were eliminated. The projected extension of the Newcastle route-setting consoles control to the west is now being planned and will ultimately make three more boxes at Forth, Elswick Works and Elswick station redundant. The Gateshead box, commissioned in 1962, took over control of 12 route miles from six mechanical boxes. It is the link between the Newcastle box and the main lines to the south under the control of the new Tyne Yard signalbox, and with the lines south of the Tyne, including the main line to Sunderland. Provision has been made to









SIGNALLING CONCENTRATION ON TYNESIDE

Top left: The control panel of Newcastle Central signalbox.

Top right: The control panel of Gateshead signalbox.

Centre left: The exterior of Pelaw signalbox.

Centre right: The control panel of Pelaw signalbox.

NEWS IN BRIEF

The BRB has offered a reward of £1,000 for information leading to the conviction of the person or persons responsible for causing the derailment of an electric train near Elm Park, Essex, on March 29 when two people were killed and 15 injured.

BR engineers are studying the possible application of thyristor tapeless voltage control experimentally to two a.c. electric multiple-units.

During May the XP64 prototype train-set was on the WR's South Wales main line, working as the 9.00 Paddington–Swansea and 15.20 back.

The Minister of Transport has approved withdrawal of BR's Southampton and Weymouth–St. Malo shipping service, which will therefore not be resumed this summer.

The NER is to withdraw local passenger services between Bradford Exchange and Huddersfield via Mirfield and Halifax on June 14; closure of six intermediate stations is involved.

Withdrawal of the passenger train service between Sunderland and South Shields, due to take place on May 3, is postponed until June 14, pending the completion of the arrangements for the alternative road services.

The WR closed 10 intermediate stations and halts on the Birmingham Snow Hill–Worcester–Hereford route from April 5.

East Anglian household coal distribution is to be concentrated on a dozen depots, instead of the present 200; main centres will be set up at Norwich, Yarmouth, Lowestoft, Cambridge, Ipswich, Bury St. Edmunds and Whittlesea, to handle from 50,000 to 100,000 tons a year (in the case of Norwich), and there will be smaller depots at Fakenham, Dereham, North Walsham, Sudbury, Diss, Melton Constable and Leiston.

A rail and road co-operation experiment began at Tamworth on May 3; after representation from the LMR, the Birmingham & Midland Motor Omnibus Co. is providing a service between the town centre bus station and the BR station for the more important morning and evening trains for an experimental period of three months.

A connection is being laid in from the ex-GC line to the ex-Midland Leicester–Burton-on-Trent line near Leicester South Sidings.

---

extend the installation in the direction of Pelaw and an extension involving the takeover of the work of St. James Bridge and Felling signalboxes has recently been authorised. Ultimately it is hoped to bring control of traffic into and out of the Tyneside freight terminal, completed at Borough Gardens, Gateshead, in 1963, under control of the Gateshead signalbox. The Pelaw power signalbox came into operation in 1960 and extended towards Sunderland the control of the signalbox it replaced; it also assumed the functions of Springwell cabin. Provision was made for an ultimate extension of its control towards Gateshead and along the South Shields and Washington branches. At the Tyne Yard, four miles south of Newcastle at Lamesley, there are two separate signalling installations, both housed in one tower; one includes control of the yard entrance and exit in its coverage of the main line and certain branches, while the other governs shunting movements in the yard, reception sidings and wagon sorting movements over the hump. This signalling system has replaced ten manually-operated boxes. The South Gosforth area is shortly to be re-equipped with colour-light signalling and power-operated points under the control of South Gosforth East signalbox, which will become a neighbour of Newcastle and Benton signalboxes with the subsequent closure of South Gosforth station and West signalboxes. In connection with permanent way renewals and the disconnection of the Leamside branch from the East Coast main line at Newton Hall, the NER took the opportunity to put the area under the control of Durham North signalbox from last December, with associated provision of colour-light signals and power-operated points. With the subsequent closure of Newton Hall box, the final link in continuous colour-light signalling over 87 route miles of the East Coast main line from Durham to Burnmouth in Scotland was completed. The installation of colour-lights over 71 miles from Heaton to Burnmouth involved the largest signalling contract to be let in this country. The work, carried on continuously from 1960 in six main stages embraced new power signalboxes at Heaton, Benton, Belford and Tweedmouth, and the installation of 1,025 track circuits, 276 point machines and 338 colour-light signals. Because of numerous level crossings, only 24 signalboxes have been closed, although several were converted to gate boxes; equipment in the remaining 22 cabins has been modernised. Electronic equipment using a single pair of wires has been employed to transmit controls and indications between controlling signalboxes in this section and certain remote interlockings. A new type of "on call" barrier has been installed at main-line level crossings on minor roads at Morpeth and Wooden Gate near Alnmouth. The twin-boom barriers of these crossings are raised and lowered by remote control from the nearest signalbox. Audible and visual warnings are given to road users before the barriers are lowered, and there is provision for the road user to raise them in an emergency.

Another NER "special offer" for passengers

The North Eastern Region, which over the last year or so has developed a considerable range of bargain long-distance fares that have successfully increased net revenue, has added a new "special offer" holiday ticket to its catalogue this summer. Providing a discount of about 4s 7d in the £1 over the ordinary return fare, it is available for journeys of over 100 miles from 39 of the NER's main stations to 65 destinations covering all the principal holiday centres in the country. For example, the Leeds–Torquay fare is £5 14s as against £7 8s ordinary return, and the Newcastle–Blackpool fare, £3 18s as against £5. The tickets are valid for travel outward on Friday, Saturday and Sunday, and for return up to 17 days from date of issue. They are on issue until September 26, except for outward travel during the three peak holiday weekends July 23–25, July 30–August 1 and August 6–8. Bookings are available by any recognised route except via London, and a break of journey is not allowed, as the tickets are available only between the stations specified.

Diesel locomotive washing machines for the NER

The NER has ordered from Smith Bros & Webb Ltd, Birmingham, two special mechanical washing machines for diesel locomotive cleaning. One will be installed at the recently modernised Gateshead motive power depot and the other at Healey Mills marshalling yard, near Wakefield, as part of new maintenance and servicing facilities for diesel locomotives which are being provided there. They will be the first locomotive washing plants to be installed in the NER. The machine cleans the sides of locomotives by vertical rotating brushes, cold water and cleaning fluid sprays. A separate spray system washes the roofs, while bogies and underframes, where oil-impregnated dirt may accumulate, are cleaned by steam and hot water applied through spray nozzles. Locomotives entering the plant pass through a photo-electric beam, which sets the equipment in operation. The cleaning process takes about 2min, leaving only the ends of the locomotives to be cleaned by hand.

Scottish closures

Several Scottish Region passenger services were withdrawn from May 3. They included: local stopping services between Dalwhinnie, Newtonmore, Aviemore and Inverness via Carr Bridge, and between Inverness and Elgin via Nairn and Forres, with the closure of 11 intermediate stations; local services between Perth, Blair, Atholl and Struan, with the closure of five intermediate stations; all passenger services on the Ballinluig–Aberfeldy branch; and all passenger services between Dumfries and Kirkcudbright, with the closure of three stations. The Scottish TUCC has reported to the Minister of Transport that in its view substantial hardship would be occasioned to users of the passenger services between Glasgow St. Enoch, Busby and East Kilbride if the Scottish Region's withdrawal proposal were carried out. The new town of Cumbernauld has been assured of a passenger service if the proposed closure of Glasgow Buchanan Street station is carried out. It will take the form of a shuttle service of diesel railcars between Cumbernauld and Springburn, where passengers will have to change to a.c. electric trains to and from Queen Street. Although this would extend the journey time from Cumbernauld to a Glasgow terminal by about 10min, the Scottish Region points out that the "Blue trains" would take passengers right into the business heart of the city. Moreover, it says that a recent analysis of passenger traffic indicated that just over half those travelling from Cumbernauld would alight at Queen Street, while the remainder would find it more convenient to use Bellgrove, High Street, Charing Cross and other "Blue train" stations. Under this new arrangement, Cumbernauld is promised a half-hourly service during the morning and evening peak periods and an hourly service at other times, with good connections at Springburn.

St. Enoch closure plan drafted?

According to the *Railway Review* of April 16, plans to fulfil the Reshaping Report's planned closure of Glasgow St Enoch station have been drafted. The paper says that trains to Ardrossan, Largs, Ayr, Girvan and Stranraer and the local service to Hillington West, Renfrew and Paisley St James would be switched to Glasgow Central, together with some parcels traffic (the remainder would move to the city's main parcels depot), and that the remaining passenger services — to Dumfries and Carlisle; East Kilbride; Kilmarnock via Dalry; Kilmacolm; and Paisley West—are slated for closure. The paper claims that a recent survey has

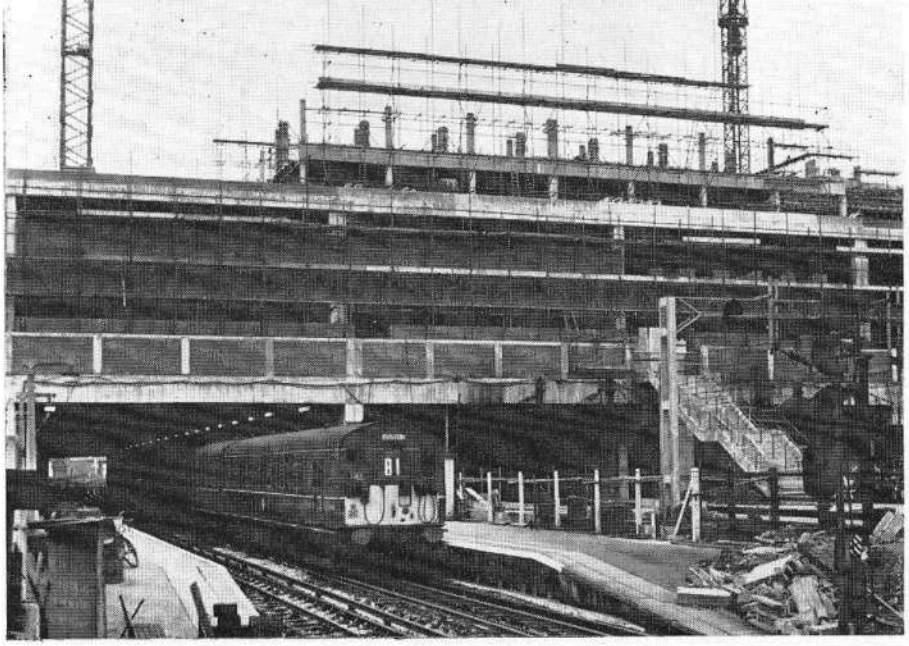
shown the East Kilbride service to carry 1,300–1,400 passengers each way on a normal weekday, and that even the worst patronised of the threatened services—to and from Carlisle—moves 100 passengers on a normal weekday. It adds that if these proposals are effected, the line between Langside and Gorbals Junctions would be closed, also the Canal line between Port Eglinton Junction and Bellahouston No. 2 box. A new double-track connection would be laid in from the neighbourhood of Shields Junction No. 1 box to the Canal lines and a single-line spur from Smithy Lye sidings to the City Union lines. Four signalboxes would be eliminated.

Scottish Region signs £8m coal contract

The Scottish Region has secured a contract with Colvilles which could be worth about £8m. It guarantees BR the carriage of more than 90 per cent of all the coal used by the steelmakers in their furnaces and cooking ovens over the next 10 years. Under this agreement, BR will transport approximately 2m tons a year to Colvilles' plants. The coal will be supplied from 20 collieries in Central Scotland, the principal ones being Polkemmet, Kingshill, Kinneil and Cardowan. The contract, which comes into operation immediately, replaces a day-to-day arrangement between the company and the railways and will be of considerable assistance to both concerns in their forward planning.

Wagons for West Highland timber traffic

A fleet of 50 wagons specially rebuilt to haul timber from the forests of Argyllshire to the £20m pulp mill at Corpach, on the West Highland line, is now entering service. The wagons have been reconstructed to a new design in BR workshops at Barassie, Troon, and will make up two bulk timber trains which will run on a conveyor-belt system between the forests and the mill. By the end of the year they should be feeding it with 350 tons daily. While one train stands at Crianlarich during the day for the receipt of timber brought in by road hauliers the other will be unloading at the pulp mill; the trains will change over during the night and the process will be repeated nightly. To cope with this volume of traffic, the Scottish Region has established a special loading depot at Crianlarich Lower station, which will be serviced by a large fleet of lorries bringing the timber in from the plantations. The 10-ton wagons, each with a cubic capacity of 22 tons, are reconstructed flat wagons formerly in use on the "Condor" express freight train between Glasgow Gushetfaulds and Hendon, which have been stored at Hendon since they were replaced by bogie vehicles. Conversion has cost just over £400 a vehicle—about a third of the cost of new stock. The conversion took only six weeks. Each wagon was stripped of most of its fittings and had end and centre panels built on to it, forming two large compartments for the receipt of the timber. This, combined with the open girder work along the sides of the wagon, gives the vehicle a high loadability factor in addition to easy access for loading and unloading. The vehicles run on roller bearings and are fully brake-fitted. This is the biggest wagon contract ever handled by the Barassie works. It will be recalled that the BR agreement with Scottish Pulp (Development) Ltd to provide transport for the Corpach pulp mill for the next 22 years removed doubts about the future of the Mallaig extension. The mill has been specially laid out for rail transport and it is expected that traffic will total at least 200,000 tons a year. This will include pulp and paper products as well as forest timber. The mill will start stocking up with timber in May and will go into production in the autumn. By June of next year it is expected that more than 500 tons of paper and pulp products will be going south each day by express freight train.

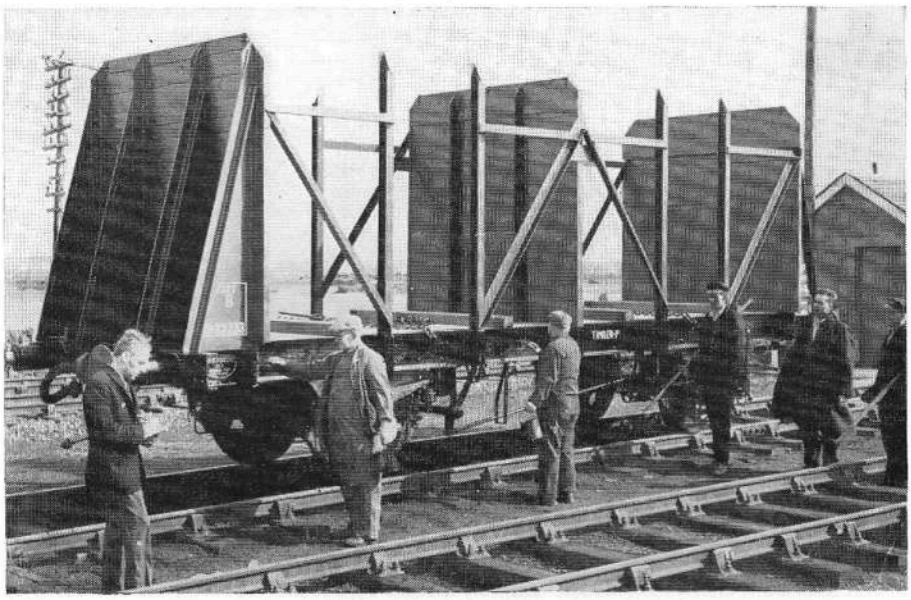


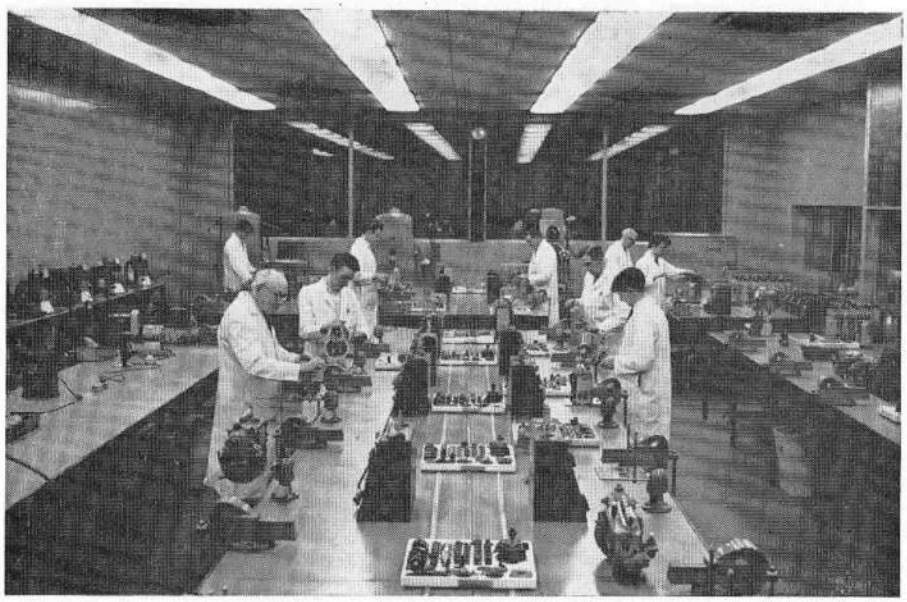
One of the largest private development schemes of BR air rights in the London area is progressing at Wembley Central, LMR. The £3m programme includes construction of flats, offices and shops on a 2½-acre concrete raft covering practically the whole of the platforms, with adjoining parking space for 500 cars. Promoted by Ravenseft Properties Ltd., the project will be complete before the full LMR electric service from Euston begins next April. *Photo by W. H. R. Godwin*

"Clean room" for Derby locomotive works

As part of the reconstruction of Derby locomotive works an air-conditioned Clean Room has been built. BR claim that it is an advance on any in use elsewhere for diesel engine fuel injection equipment maintenance and points particularly to the quality of the lighting, the purity of the atmosphere and the silence due to special insulation and noise-absorbing panels. The room has been provided to deal with increased need of reconditioned fuel pumps, injectors and nozzles for diesel traction in general. The shop, which supplies both the works and motive power depots, will have an output of 13,000 fuel pumps, 24,000 injectors and 16,000 nozzles per annum when operating on a double shift. In the design of the room, the work and movement of the components was carefully arranged on flow-line principles. Pumps and injectors are stripped and thoroughly cleaned outside the Clean Room, using air agitated de-greasing and de-rusting compounds and a de-carbonising bath. There are areas for hot water pressure-spraying and rinsing. An ultrasonic cleaning machine is also available. Critical inspection using modern air gauges decides if a particular item is to be serviced or scrapped. Polyester trays

One of the former "Condor" flat wagons converted at Barassie works for Scottish Region timber traffic to the Corpach pulp mill, on the West Highland line *(see this page)*.





The new "Clean Room" at Derby workshops, BR. The fitters in the foreground are re-assembling fuel pumps and those at the far end of the room are testing the overhauled pumps.

carry a complete set of details necessary for the re-assembly of the various types of pump and with approved components are passed into the Clean Room through a pneumatically-controlled double window hatch, which has an interlocking device to prevent both glazed doors being open at the same time. A conveyor takes the trays to one end of the room, where all items rejected at the inspection stage are replaced from the stock of new and repaired details. The trays, each now containing a complete set of details for a particular type of assembly, are passed to the workbenches and travel between guides, supported by ball-bearing runners. On the steel-framed workbenches with top surfaces of sheet vinyl, the re-assembly is carried out by fitters, each with a specialised kit of tools. After testing and adjustments in the same room with the aid of the latest equipment, the injectors and pumps are treated with an anti-rust compound and vacuum sealed in plastic bags before going out again through the special hatch. Packed in individual wooden boxes and then into special pallets, the components are ready for distribution to engine assembly workshops or motive power depots throughout the country. Eating and smoking is not allowed in the room, and all staff wear white overalls and overshoes as a further measure of cleanliness promotion. Similar Clean Rooms are planned for Eastleigh, Swindon, Crewe, Doncaster and St Rollox locomotive works.

Signalling contracts for AEI-GRS

Two contracts for signalling equipment have recently been awarded to AEI-GRS by the BRB. One covers 83 track miles of the SR main line to Bournemouth, between Worting and St Denys, to be controlled from Eastleigh. The other is connected with the Glasgow suburban electrification extension and embraces 60 track miles from Hillington to Gourock and Wemyss Bay, to be controlled from Paisley. Each installation embodies Type NX push-button route light control panels of the matrix type and geographical circuitry will be used in the interlocking plants. Time division multiplex and frequency division multiplex systems will be used for the remote control of satellite interlockings and the transmission of remote signal and track circuit indications to the central control signalbox. British Insulated Callender's Construction Co Ltd has received an order from the Scottish Region, British Railways, for the supply and erection of 25kV a.c. overhead equipment for the electrification of 37 route miles between Glasgow Central, Gourock and Wemyss Bay. The value of the order is over £800,000.

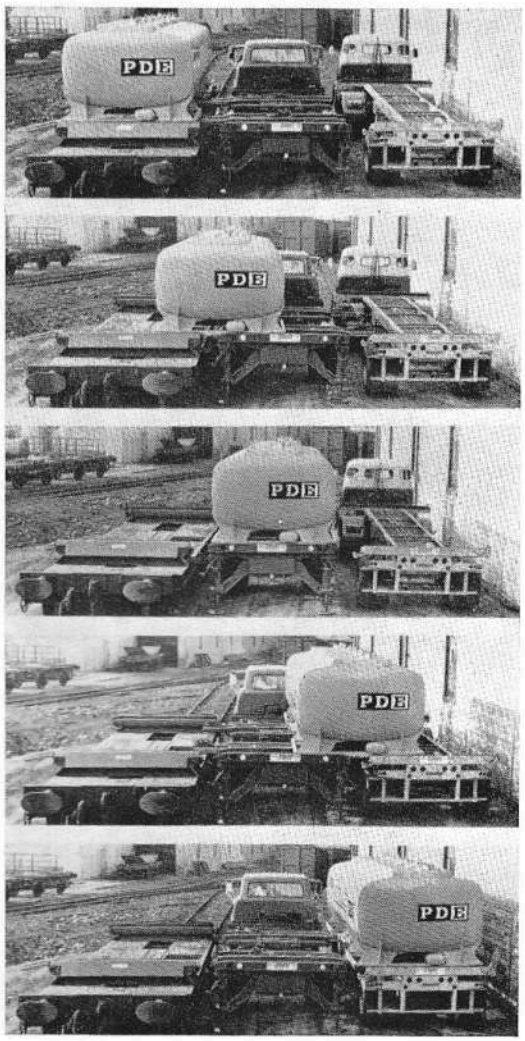
It's cheaper by train—provided there are any

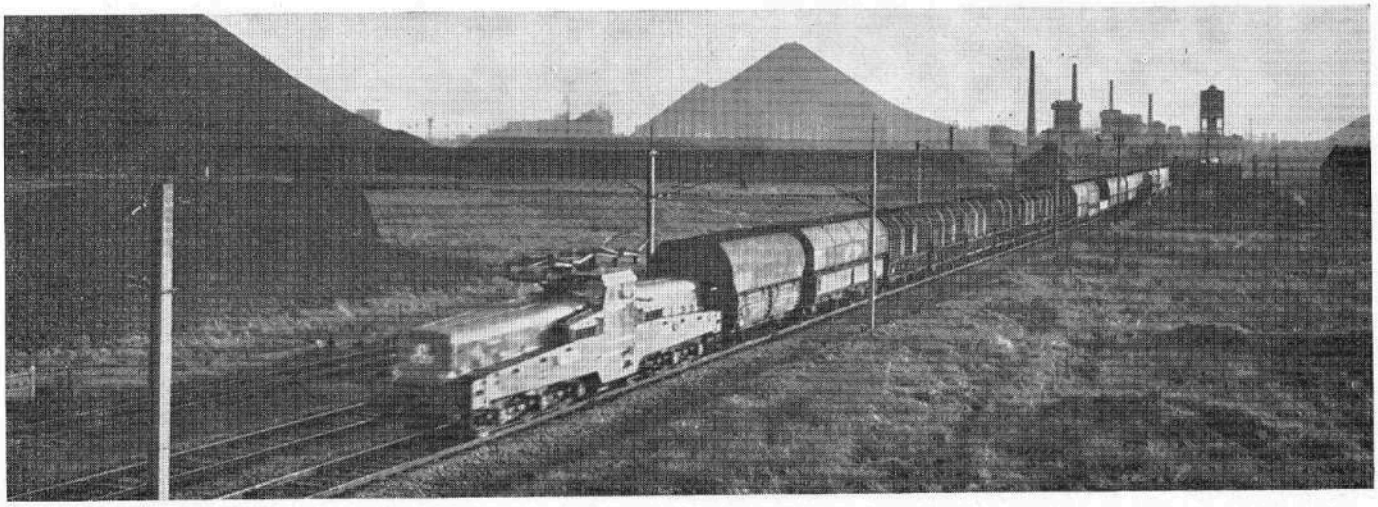
"Go by train: off-peak day return tickets to Oldham. Mondays to Fridays by any train after 9.30" proclaimed bold posters put up on stations between Royton and Oldham, Lancs, at the beginning of April, writes T. A. Fletcher. But mid-week off-peak trains from Royton were discontinued some months ago. The *Oldham Chronicle* put this point to the Royton stationmaster, who is reported to have replied: "It is a routine notice. We are advertising the facilities, not the trains. The facility is there if ever the trains are restored."

THE DEMPSTER SIDELODER FOR CONTAINER TRANSFER

THE Dempster Sideloder, a lorry-mounted handling system for interchanging bulk freight containers between rail and road vehicles, is being introduced to Britain and the Continent by Powell Duffryn Engineering Co. Ltd., of Cardiff. The Sideloder needs only a single operator—the driver, seated in his cab—to transfer a freight container from a rail flat car to a conventional lorry or the reverse in less than 2min. Another advantage is its mobility. It costs upwards of £8,000 complete.

The Sideloder's working principles were jointly conceived by Powell Duffryn Engineering and Dempster Bros. Inc., of the USA, who carried out the development work and two years ago launched the Sideloder in America, where it is now in use by a number of railroads. Rail flat cars and road delivery vehicles are easily adapted at an average cost of under £200 a vehicle for use with the Sideloder. They need only to be fitted with channelled bolsters to receive the guide rails mounted on containers. The lorry-mounted Sideloder is designed to handle containers 20ft long, but a trailer-fitted version is available to deal with containers up to 40ft in length. The operator draws up beside a container-carrying flat car and raises the Sideloder to the necessary level by means of built-in hydraulic levelling jacks. Then the bolsters of the delivery vehicle are aligned with those of the Sideloder. Sliding bail platforms, located between channelled bolsters on the Sideloder vehicle and driven by a reversible hydraulic motor, move out to engage hooks under the container, then draw it on to the Sideloder. Using the bails on its other side, the Sideloder completes the operation by pushing the container into the carrying position on the delivery vehicle. Alternatively, it can leave the container standing on simply-installed legs for later collection by the delivery vehicle. It is understood that both BR and some oil companies have shown interest in possible use of the Sideloader in Britain.





A French Railways 4,000 h.p. CC-14000 class Co-Co 25kV a.c. electric locomotive at the head of a 1,800-ton coal train in the Pas-de-Calais coalfield.

beyond the Channel

Edited by Paul Drew

FRANCE

Motive power policy

ALTHOUGH all the large SNCF diesel-electric and diesel-hydraulic locomotives in service are stated to be performing well and dieselisation of non-electrified main lines and groups of lines (as in the Western Region) is proceeding satisfactorily, the future of main-line diesel traction is by no means decided. The declared policy has been to dieselise main and secondary lines not included in the present main-line electrification schemes, which when completed will result in 72 per cent of all SNCF traffic being electrically hauled and 23 per cent of all route-mileage being electrified. The principal sections now being or about to be electrified are the Paris–Havre and Marseilles–Ventimiglia main lines and Paris suburban services of the Northern and Eastern Regions, and in due course the Northern Region approaches to the Channel Tunnel. The policy is flexible as regards future suburban passenger electrification and any sections where increases in freight traffic flows may make electric traction economic. Despite their good performance, the main-line diesel locomotives have the disadvantage of requiring a force of specialist maintenance staff, which is not easy to build up and keep at strength despite the experience afforded by the SNCF's many diesel railcars and smaller locomotives; main-line diesel locomotive maintenance is said to require more expertise than do the equivalent duties for an electric locomotive, and in France today electricians are easier to obtain. Furthermore, the Government may feel that the national economy demands that electrification continue for the sake of the electrical industries and of the civil engineering undertakings involved, more particularly in a.c. projects. Most locomotive and rolling stock builders are prepared to supply both electric and diesel units.

3,400-ton coke trains

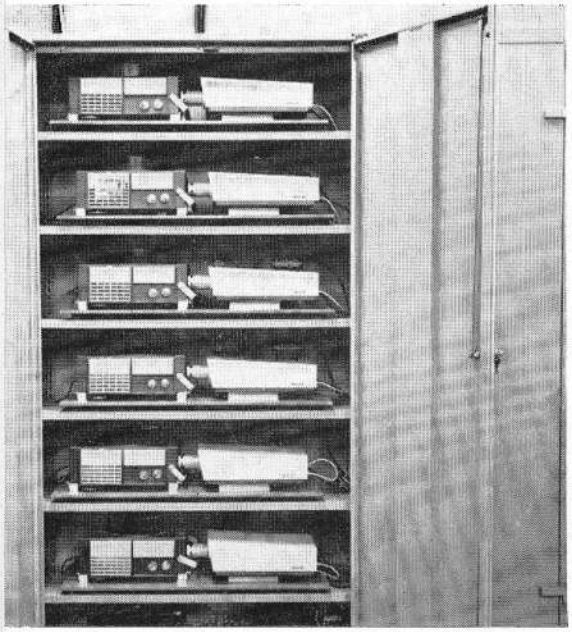
Two thousand tons of coke is required early each morning at the Dunkirk steel plant of Usinor. It is a 1,200-acre plant, which started production in 1963 and is now producing at the rate of 1.5m tons annually. Coke is supplied by the Houillères Nationales du Bassin du Nord et du Pas de Calais. The highly-rationalised works organisation requires this to be delivered in one trainload of 2,000 tons capacity (3,400 tons gross). The coke is despatched from Pont-à-Vendin, near Lens, some 70 miles away, over lines electrified at 25kV a.c. The train is made over to Usinor, on the exchange sidings, at 22.00 and the empties are ready to work back next morning. Unloading into under-rail hoppers takes 5hr, while the wagons are propelled over the hoppers by a radio-controlled locomotive. Because of the time taken to load at the coking plant and to unload at Dunkirk, two sets of close-coupled, air-braked wagons are needed, worked to and from Dunkirk on alternate days.

The number of wagons per train varies according to individual wagon capacity. One type of six-wheel wagon has a capacity of 58 tons. The hopper wagons are the property of STEMI (Société des Transports et de la Manutention Industrielle). The motive power is a CC-14000 class 4,000 h.p. freight locomotive, which handles the train unaided. The length of these trains poses no very particular difficulty in this area, where the Chemin de fer du Nord was operating coal and coke trains of up to 2,600 tons gross weight before the war, and the layout of sidings and loops was devised accordingly, as was the signalling, since replaced largely by colour-lights. Because of the saving in manpower, including, in many instances, electrically-hauled trains manned by only two men, the driver and driver's mate, who acts as guard, the cost to the SNCF of working these heavy trains is low.

Paris–Havre electrification

The electrification of the 143-mile Paris–Rouen–Havre line of the SNCF Western Region, writes Brian Haresnape, is of particular interest in that some of the existing clearances of tunnels and bridges are creating problems similar to those BR has had to face on the Euston–Liverpool/Manchester scheme. English finance and engineering played an important part in the original construction, and to this day evidence of it can be seen in many structures, in terms both of architectural style and of proportion, including Barentin viaduct, between Rouen and Havre. This has involved SNCF engineers in a particularly complex programme of track lowering and bridge raising. These works will largely dictate the final completion dates. Much progress has been made with erection of masts and catenary, more particularly on open stretches, and driver training runs will start next October on a short stretch between Achères and Eragny (this will also link with the existing Northern Region electrification to Creil). The first, and extensive part of the main line to operate commercially will be the 70 miles from the marshalling yard at Achères, near Paris, to the newly extended yard at Sotteville, just south of Rouen. It is hoped that this will come into operation on January 1, 1966. Oissel, at the south end of Sotteville yard, will become the temporary engine-changing point for trains proceeding beyond Sotteville. It has been chosen for two reasons: primarily because the tunnels each side of Rouen Rive Droite passenger station will take somewhat longer to modify and also because the station is not suited to the operating movements, due to its situation in a deep cutting between twin-track tunnel mouths. Diesel locomotives will be used extensively to reduce the smoke nuisance during tunnel modification. The next section to open will be from Achères into Paris, so affording through electric working to Oissel. Paris St. Lazare terminus is undergoing extensive modification of tracks and signalling. April, 1967, should see inauguration of electric traction from Oissel to Motteville (28 miles) and the date scheduled for completion of electrification of the last 35 miles to Havre is October, 1967, with full electric working in 1968. The line from Rouen to Dieppe, which diverges from the Havre line at Malaunay, is not included in the scheme. Diesel-electrics of the A1A-A1A 68000 class are already working most Dieppe boat trains. The alternative, lightly-trafficked line from Paris to Dieppe via Gisors is also to be dieselised completely.

The new electric motive power will consist entirely of BB 16500 class locomotives plus some multiple-units. Seventy-six BBs will replace 149 steam locomotives (45 2-8-2Ts, 51 Pacifics and 53 2-8-2s). The balance of



1 2 3

TRAIN INDICATION BY TV ON NETHERLANDS RAILWAYS

A NEW television system of train indication to passengers was introduced by the Netherland Railways at Eindhoven, home of the Philips concern, in March. For some two years previously Philips TV equipment had been on trial at Eindhoven station.

Eindhoven, which handles about 150 passenger trains a day, is situated at the intersection of the Rotterdam–Venlo–Western Germany and Amsterdam–Maastricht lines. The station has six platforms, on each of which six TV receivers have been installed at intervals **(3)**. Each group of six sets is on a closed circuit with a compact TV camera that scans an automatic projector **(1)**. The rotating magazine of the projector contains black and white slides carrying the complete 24hr programme of scheduled train services at one platform. The equipment is operated by push-buttons from the signalbox. If a train has to be re-routed to an unscheduled platform, the operator has facilities to re-connect the relevant projector and camera to the group of TV sets on the platform to

---

remaining steam power will give way to diesels.

Havre main-line steam power

Meanwhile, the steam locomotives on the Paris-Havre line are maintained with a refreshing keenness. Although no new locomotives have been delivered to the line since 1947 (date of the last 141R 2-8-2s from America), the general standard of steam operation has not been allowed to decline pending electrification. Some of the ex-Etat 231D and 231G compound Pacifics are in their last months of useful life, but to ride behind them today is to realise what magnificent machines they remain. Batignolles depot, in Paris, still presents a brave spectacle of many well-kept locomotives awaiting their next spell of duty, resplendent with polished brasswork and burnished steel. Only the rugged oil-burning 141R mixed traffic 2-8-2s present a less exemplary exterior, mainly because they are common user locomotives.

The large locomotive works at Sotteville Quatre Mares is expected to undertake the repair of steam locomotives until the final days of steam on the SNCF (probably the early 1970s). Besides Western Region power it now deals with locomotives from other areas, including the massive 241P 4-8-2s from the South East (Nevers) and Eastern Regions (Chaumont). Later this year, part of the works will be converted to diesel repairs. The sensible policy adopted by the SNCF for the difficult transition period from steam to diesel and electric traction, in which care continues to be expended on the existing machines despite their increasing age and consequent troubles, makes an interesting comparison with the situation on BR.

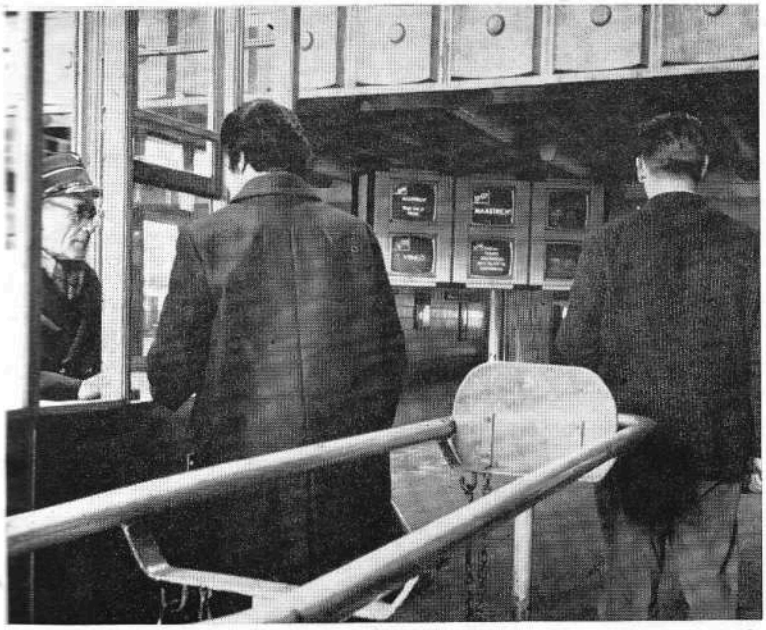
Anglo-Breton passenger traffic

Discontinuance of the British Railways' summer-only sailings between Southampton and St. Malo has changed the pattern of public surface transport between the UK and Britanny. The rail-and-sea routes are now via Paris or via the Thoresen car ferry between Southampton and Cherbourg. The 6.55 railcar from Cherbourg to Rennes (connecting to most stations in Brittany) until May 29, and thereafter the 6.55 locomotive-hauled train to St. Brieuc and to Rennes, Nantes and Bordeaux, and the corresponding northbound services connect with the Thoresen night sailings. Through rail-sea-rail bookings between British and French stations by this route were recently being negotiated. Meanwhile, there is reported to have been pressure by Breton interests on the SNCF to operate a shipping service between St. Malo and Southampton, with the SNCF as operator in its capacity as a provider of Franco-British rail-and-sea links; no result of this action is expected.

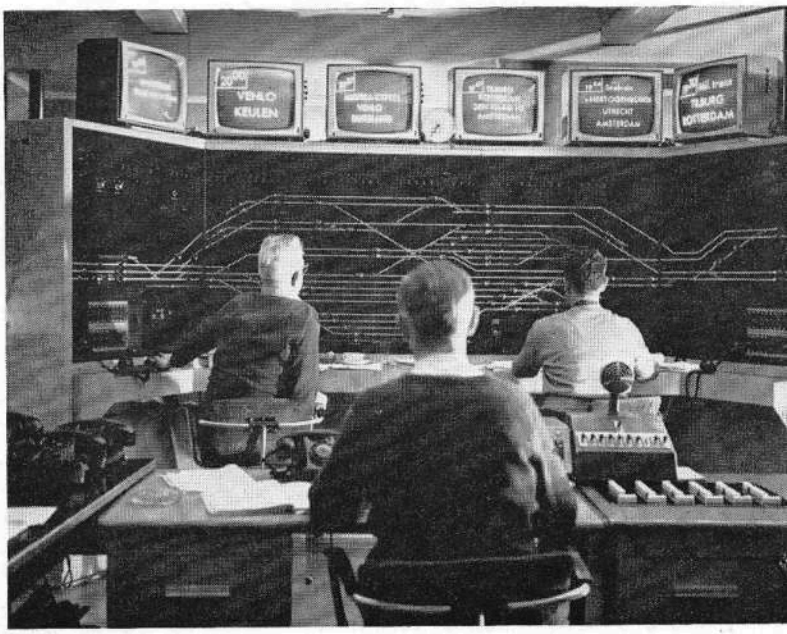
A Dutch-built refrigerated wagon with plastic body, built by the Werkspoor and in use on the Netherlands Railways *(see facing page)*.

Passenger services in Greater Paris

According to present plans, the greater part of the burden of providing rail passenger transport for rapidly increasing Greater Paris is to be borne by the RATP (Régie Autonome des Transports Parisiens). Basically, the SNCF will complete electrification of its Northern and Eastern Region suburban lines, and the main-line termini will remain much as they are, apart from modifications to them necessary for the SNCF's domestic purposes (such as are now in progress at the Gare d' Austerlitz) and from any construction beneath them of deep-level RATP lines. The RATP will construct the Réseau Express Régional deep-level lines, which, like the first such line (west-to-east) now under construction, will connect at each end with SNCF surface suburban lines, where the RATP trains will run over the former SNCF tracks.



4



5

which the service has been diverted. There is an independent seventh camera under a glass writing-plate, by means of which emergency messages can be screened on any platform **(2)**.

In addition to the platform receivers, there is a battery of six TV sets near the station's entrance barrier which show the departures and destinations from each platform **(4)**. A further six screens are mounted above the operating console in the Eindhoven power signalbox, from which the equipment is operated by the traffic regulator **(5)**.

A conventional type of TV receiver in a specially designed steel case has been adapted for the Eindhoven installation. Philips encountered some difficulty with reflections and the effect of daylight on contrast and visibility of the screened text. The announcements on receivers placed in shadowed areas are much clearer and easier to read than those on the screens at the end of the platform awning. Nevertheless, Philips and the Netherlands Railways have developed a system that, compared with the mechanical train indicators at Utrecht and Amsterdam, seems to offer more operational efficiency and flexibility, provided clarity of reproduction can be improved.

G. L. S. WILLEMSE

NETHERLANDS

Plastics for refrigerator wagons

Mechanically-refrigerated 20-ton capacity Interfrigo vans with underframes and bodies built by Werkspoor, which were recently put in service on the NS, have walls, floors and roofs of two ⅛in layers of polyester enclosing a layer of polyurethane. This is reported to afford good insulation and great structural strength of the body. The refrigerating machinery was supplied and installed by J. Stone (Deptford) Ltd. The cooling unit is driven by a Mercedes-Benz diesel engine, and the temperature can be adjusted within a range of minus 20 deg. to plus 60 deg. F. As in other new freight vehicles for international service, there is provision for subsequent fitting of automatic couplers. Top running speed is 75 m.p.h. Through ducting of standard UIC electrical heating connections enables the wagons to be coupled with electrically-heated stock.

BELGIUM

Safer by rail

No passenger was killed or seriously injured in an accident to a train on the SNCB in the six years 1959–1964, when 1,500m passengers travelled some 30,000m passenger-miles. (This also illustrates the preponderantly short-distance character of SNCB passenger traffic). Drawing attention to this record, the SNCB points out that during those six years some 10,000 people were killed in road accidents.

Station car parks

Two hundred SNCB stations now have car parks for the use of ticketholders only. Holders of all-line "general season tickets" are issued with special cards authorising use of any of these parks, but season tickets for travel between two specified stations afford parking at those stations only.

WESTERN GERMANY

Electrification progress

Full electric working at 15kV has been inaugurated by the DB over more than 500 route-miles in the past six months. Electric traction through from the Mediterranean, Alps and Vienna to German North Sea tidewater is a reality since December, from Hanover via Wunstorf to Bremen (76 miles), and since April, from Hanover via Celle to Hamburg and Altona (115 miles). The latter conversion involved use of contact wire of 0.166, instead of 0.55 sq. in., cross-section, to allow speeds of up to 125 m.p.h. (*see the April issue*). Partly for aesthetic reasons, masts in the Hamburg area have been kept as low as structural considerations allowed, which increased costs by 25 per cent. At one point in the area the DB tracks cross tramway tracks on the level, necessitating power switching arrangements where the contact wires intersect—the only example of such a crossing in Germany. The substation at Hamburg–Harburg also provides power for the CTC installed over part of the route to Hanover. The overhead electric main-line and 1,200V third-rail S-bahn trains share the same tracks through Hamburg to Hamburg–Altona.

March saw commencement of electric working from Würzburg via Ansbach to Treuchtlingen (76 miles), so completing an alternative electrified route between the North and Munich. In mid-May electric traction began between Hagen and Frankfurt (160 miles) via Siegen and Giessen, an important relief route, mainly for freight trains, between the Ruhr and the South roughly parallel to the congested Rhine left- and right-bank lines between Mainz and Wiesbaden, and Cologne. Introduction of the summer timetable on May 30 coincides with full electric working over three short sections: Neuss to Mönchengladbach (10 miles), Saarbrücken to Wemmetsweiler, in the Saar basin (12 miles), and Lehrte (near Hanover) via Hildesheim to Nordstemmen (25 miles), serving a developing industrial area.

A recent map shows electrification to be in progress over the following sections: Osterfeld Süd to Recklingshausen and Hamm (a relief route mainly for freight trains); Haltern and Hamm to Münster and Osnabrück; Kassel to Bebra; Kassel to Giessen and Frankfurt (a relief to the already electrified Hanover – Bebra – Fulda – Frankfurt trunk line); Oberhausen to the Dutch frontier beyond Emmerich; Cologne to Aachen (pending solution of the problem of linking up with the Belgian 3,000V lines at Herbesthal or at some nearby point); Cologne via Mönchengladbach to the Dutch frontier at Kaldenkirchen/Venlo; and Aachen to Mönchengladbach.

Wagon fleet increased

The Federal Railway took delivery in 1964 of 8,000 new goods wagons. Since 5,200 of these replaced condemned or obsolete vehicles, the total DB fleet increased by only 2,800, to nearly 280,000. The proportion of special-purpose wagons also rose. There are also some 40,000 private owners' wagons.

4,000-h.p. diesel-electric sold?

The German Federal's 4,000 h.p. V320 Co-Co diesel-hydraulic prototype is to be sold in the autumn, on termination of the International Transport Exhibition at Munich. RENFE is believed interested.

Gas-turbine booster in diesel-hydraulic

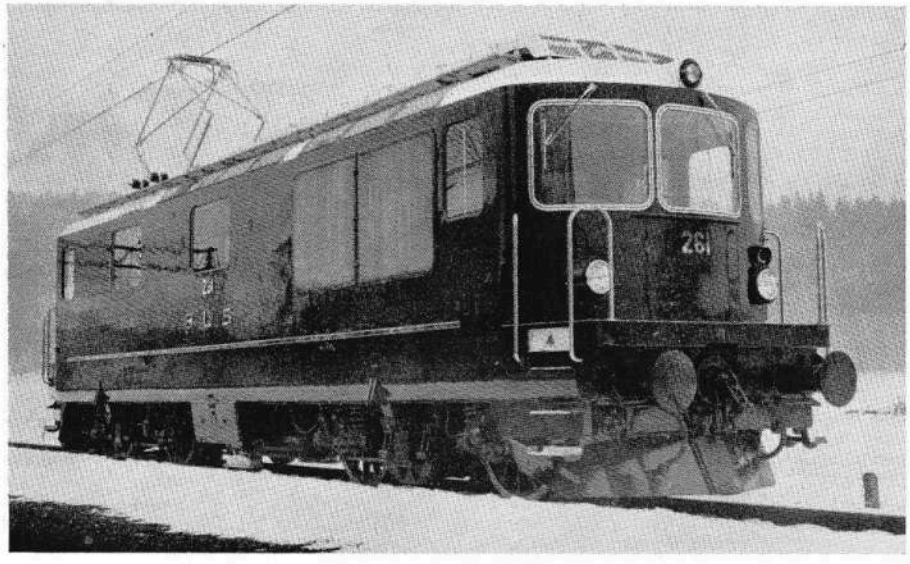
A second modification of the 1,900 h.p. V160 class diesel-hydraulic Bo-Bo locomotive, equipped for electrical train heating, is being placed in service on the DB. In the V162 (*see April issue*) the train-heating generator is driven by a 500 h.p. diesel engine, which can be switched on to the hydraulic drive and so supplement the power of the main engine as required. In the V169 the generator is driven from the main engine; the loss of tractive power is made good by a 1,000 h.p. gas-turbine booster, which is also used when additional power is needed for heavy loads, gradients, etc. Both classes include hydro-dynamic brakes. At the time of going to press, three V162 and one V169 had been ordered.

SWITZERLAND

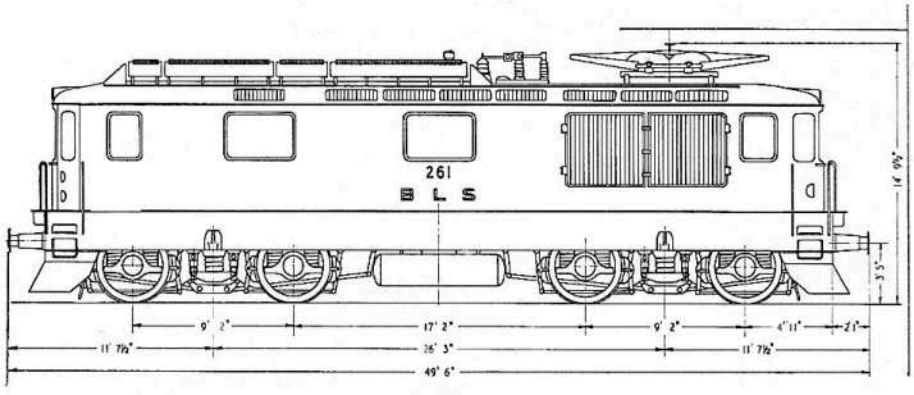
New Lötschberg 6,240 h.p. locomotives

With the new Bern–Lötschberg–Simplon Railway 6,240 h.p. Bo-Bo electric locomotive mentioned in the April issue this small undertaking once again achieves a world record in locomotive design. The original BLS Bo-Bo design, introduced in 1944, was the first in the world to transmit 4,000 h.p. through the four motorised axles of two four-wheel bogies; the new design adds more than 50 per cent to this power output, but within the same total locomotive weight of 79 tons. The first BLS locomotives, which worked its trains from the opening of the line in 1913, were unique, with their 1D1 wheel arrangement; with their weight of 103 tons their rating of 2,500 h.p. represented an output of 24.2 h.p. per ton. Next came the large 1Co-Co1 of 1926, with a rating of 5,280 h.p. and a weight of 142 tons, or 37.2 h.p. per ton. The Ae 4/4 Bo-Bo type of 1944, 4,000 h.p. and of 79 tons weight, showed a further substantial advance, to 50.6 h.p. per ton, while the later twin Ae 8/8 design, 8,800 h.p. and 158 tons in weight, showed a further slight advance to 55.8 h.p. per ton. Now comes the Ae 4/4 II design, 6,240 h.p. and still no more than 79 tons in weight, which can claim a world record at no less than 79.0 h.p. per ton, more than three times the figure for the 1D1 units of half a century earlier.

The new locomotive type is designed to handle 600-ton loads over a main line of which the ruling gradient on the lengthy approaches to the 4,067ft altitude of the Lötschberg Tunnel is 1 in 37, with much curvature limiting the speed on the mountain section to 75 km.p.h. (47 m.p.h.). It is an extremely compact machine, with a body only 45ft 3in long; the original design was for a locomotive 49ft 6in over buffers, but in the first two completed examples, Nos. 261 and 262, the length has been increased by platforms at both ends, similar to those of the Ae 6/8 units. A speed up to 87 m.p.h. is permissible, though there is no part of the Lötschberg system with a sufficient length of straight or slightly curved track to make such a speed safely possible. Rheostatic braking is provided for, with the current dissipated in grids above the locomotive roof, and also the Oerlikon automatic brake. Nos. 261 and 262 will be used on both passenger and freight trains, and will help further in providing for increased train-loads and thereby in reducing line occupation over a route which operates under considerable traffic pressure. They have been built jointly by the Swiss Locomotive Co. (SLM) of Winterthur and Brown Boveri of Baden.



The Lötschberg Railway's new 6,240 h.p. Bo-Bo electric *(see this page)*.



The Swiss Federal "Crocodiles"

One of the earliest SFR locomotive classes is nearing the end of its hard-working existence; it is the Ce 6/8 class, first introduced in 1920. Its 1C-C1 wheel arrangement and its distinctive appearance—centre cab and downward sloping bonnets at both ends—earned the nickname of "Crocodile". During 45 years of service, mainly in the arduous conditions of the Gotthard main line, No. 14284 has covered a total of 2,388,081 miles. Of the 20 locomotives of this type, Nos. 14274 to 14283 are being adapted for yard service and the rest are being scrapped. The Ce 6/8 class was of 2,240 h.p. only and was limited to a maximum speed of 40 m.p.h.; there have also been the Be 6/8 series of 13 units, similar in appearance, and of these Nos. 13251 to 13259 inclusive, which have the higher rating of 3,640 h.p., are being adapted for service in the Rhine port at Basle.

ITALY

Faster to Sicily

Accelerations from May 30, states J. H. Price, include a new pair of first-class-only day *rapidi* between Rome and Palermo/Catania, Nos. R 563/562, affording much the fastest surface travel yet to and from Sicily. Southbound, departure from Rome is at 8.35 and arrivals in Palermo and Catania are at 20.50 and 19.16 respectively; the northbound train leaves Catania at 12.03 and Palermo at 10.25 and is due Rome at 22.28. Fast timings include: between Rome Termini and Naples Central, 134 miles, in 2hr southbound and 2hr 2min northbound; Naples and Villa San Giovanni (ferry terminal) 287 miles, in 6hr 1min southbound and 5hr 55min northbound, with three stops totalling 9min in each case; Palermo Centrale and Messina Centrale, 145 miles, in 2hr 43min northbound, with one stop; and Catania and Messina Centrale, 59 miles, in 1hr 7min northbound, with a stop at Taormina. Both routes in Sicily are very largely single line. The whole route is electrified. At the time of going to press, the make-up of this pair of trains had not been announced or the name, if any.

No more steam at Milan

Inauguration of electric traction at 3,000V, with introduction of the summer timetable, of the Milan-Mortara (35 miles) line ends steam working as routine practice to and from the FS Milan stations and depots. The Milan-Mortara line serves a highly industrial area, affording intensive commuter and freight traffics. Its electrification also provides an alternative electrified route between Milan, Alessandria and Genoa.

Brenner line voltage conversion

According to an official announcement, the whole of the Brenner main line is now electrified at 3,000V d.c. This follows conversion of the last remaining section between Bolzano and the Austrian frontier at Brennero from its original 3,700V three-phase.

traffic report

Edited by
G. M. Kichenside

Class B1 4-6-0 No. 61327 passes Filton Junction, Bristol, with the 7.50 Paignton–Newcastle train on August 22, 1964. *Photo by G. T. Robinson*

London Midland

A FURTHER stage in the modernisation of the LM Western Lines is scheduled for the weekend of May 29–30 when the new centralised power signalbox at Willesden is to be commissioned. With the introduction of the new Bletchley power box at the end of June a.c.-immune colour-light signalling and continuous track circuiting will be in operation on the Western Lines as far as South Hampstead, two miles from Euston. Thus as soon as the power supply is complete traction current will be switched on between Rugby and Tring, and Watford and Willesden probably during August or September. Some freight services will be electrically-hauled as far as Willesden in the winter service and the LMR is believed to be considering the use of Bletchley as an electric locomotive changing point for passenger trains for about three months until the traction supply is completed into Euston. As a result, the existing motive power depots at Willesden, Camden and Bletchley will be closed and their diesel allocation concentrated at Willesden and Rugby district electric depots until full electric working is inaugurated. Watford shed was closed at the end of March and Rugby shed was expected to close at the end of May and its steam allocation to be transferred to Nuneaton. Two green-liveried Standard Class 3 2-6-2Ts, Nos. 82032/3, arrived at Willesden, in April en route to the Southern Region.

Steam power continues in considerable use on freight and occasional passenger duties at the southern end of the Western Lines; during April, however, steam appearances were less than in previous months, largely because there was no longer any need for steam heating which allowed greater use of EE Type 1 diesels on passenger and other services. Indeed a shortage of power over the Easter period led to the use of Type 1s Nos. D8005/44 in multiple on a down Liverpool relief of 14 corridor vehicles on April 15 and several were reported singly on Euston–Bletchley local services during the period. BR/Sulzer Type 2 No. D5145 was also employed on express work on April 15. Brush Type 4 diesels appeared on a number of revenue-earning services south of Rugby during April. On April 21 No. D1767 (30A) was employed between Dagenham and Rugby on north- and southbound Fords car-carrier trains, a working which since appears to have become regular on Saturdays, but the most unusual Brush Type 4 appearance was on the previous day when one of the Midland Lines' allocation from Nottingham, No. D1812, headed the 18.06 Euston–Bletchley local. Brush Type 4s also reached Euston, probably for the first time, on April 10 with specials for the England–Scotland international football match at Wembley; No. D1634 (5A) headed the previous night's 21.25 Kilmarnock–Euston and No. D1631 (5A) had charge of the 22.35 Perth–Euston.

Another a.c. electric locomotive, No. E3048, was towed up to Watford on May 2 and has subsequently been used on crew training runs between Tring and Watford; the driver-training simulator has not been entirely trouble free and failed for a time during the third week of April. Four more Derby-built a.c. electric multiple-units for the London–Rugby local services—units 047–050—have arrived at Rugby district electric depot and were undergoing trials and crew training between Rugby and Crewe during April. At least 17 of the standard Class AL6 a.c. electric locomotives have arrived at Crewe district electric depot for acceptance trials, Nos. E3101/3-9 from Doncaster works and the first of the English Electric batch from Vulcan Foundry, Nos. E3161-9. Nos. E3108/9 were delivered with yellow warning panels, the first a.c. locomotives to be so distinguished. Two AL6 locomotives, No. E3101/3, were on revenue-earning duties on May 1, when they were employed on FA Cup specials from Liverpool to London as far as Rugby. Until then, use of AL6 locomotives on passenger trains had been confined to crew-training duties, on which they were run in tandem with a locomotive of the earlier series.

Liner train trials continued during April; the most usual formation included 15 Liner train bogie wagons hauled by an EE Type 4 diesel, accompanied by a dynamometer car. The Liner trains are equipped with a two-pipe air brake system and can thus be worked only by locomotives equipped to operate a train air brake. Among locomotives so fitted are English Electric Type 4s Nos. D370/1/7/8/80, and Brush Type 4s Nos. D1100-11, D1631-81 and D1758-1999.

The special high-speed test run on April 8 behind BR/Sulzer Type 4 No. D2 and thought to be for the assessment of riding qualities of rolling stock, if not scheduled at electric timings, nevertheless produced some high speeds believed to be in excess of 100 m.p.h.

During April all freight trains on the Rugby–Peterborough line were diverted to alternative routes, leaving only the local stopping passenger service, itself proposed for withdrawal and at present under consideration by the TUCC.

A number of diesel multiple-unit workings on Birmingham Coventry–Rugby services have reverted to steam operation and steam or diesel locomotive power has also been employed on other Birmingham suburban services from time to time to cover a shortage of multiple-units away under repair.

The reorganisation of diesel motive power allocations on the Midland Lines (*see page* 308) has resulted in revised depot maintenance arrangements. Each diesel maintenance depot on the Midland Lines is responsible only for certain classes of maintenance; in the Nottingham Division, for example, Derby Etches Park carries out only examinations 2 to 5, Derby No. 4 shed and Kirkby-in-Ashfield the first two class 1 examinations, and Nottingham and Burton examinations 1 to 3. It seems likely that Etches Park depot may revert to diesel multiple-unit maintenance only in the future. Nottingham steam shed was closed on April 15 and its allocation dispersed to Annesley, Derby and Kirkby-in-Ashfield.

Steam returned to the London end of the Midland Lines on April 24 when "Britannia" Pacific No. 70052 was employed on a special excursion from St. Pancras for a tour of Nottingham and Lincolnshire. On March 17 the three preserved locomotives formerly stored at Derby, Midland 2-4-0 No. 158A, Midland 4-2-2 No. 118 and LTS 4-4-2T No. 80, were towed north to Hellifield to join other preserved locomotives, including Class V2 2-6-2 No. 4771 *Green Arrow* and the two NER electric locomotives Nos. 26500/1, stored at Hellifield shed, which is now under the jurisdiction of the Curator of Historical Relics.

BR/Sulzer Type 2 diesels took over a number of Marylebone–Nottingham passenger trains early in April, although steam power has since returned to most of the workings. On April 2 the 16.38 Marylebone–Nottingham was powered as far as Woodford by No. D5024 (1A), which returned with the 17.15 from Nottingham. On the following day, No. D5086 (D14) had charge of the 16.38 from Marylebone, which it took

through to Nottingham and returned light to London later that night. The most notable visitor to the London end of GC in April, however, was Class B1 4-6-0 No. 61030 (56B), which headed the 17.15 Nottingham–Marylebone on April 5; after servicing at Willesden it returned north early the following morning with the 3.40 Marylebone–Nottingham newspaper train. Following the partial closure of Woodford yard a special train composed of two brake-vans now runs each day to carry redundant staff from Woodford to Aylesbury to cover staff shortages in the London area. The train is normally powered by one of Woodford's Class 4 2-6-4Ts, but on April 15 was in the hands of Gloucester Standard Class 5 4-6-0 No. 73021.

The summer timetable shows no changes in the basic Mondays to Fridays GC line passenger service but, on Saturdays, the usual crop of reliefs between the North, the Midlands and the South Coast is diverted to other routes and only the Newcastle–Bournemouth trains will still use the GC.

The failure rate of Brush Type 4 diesels employed on the former GW main lines in the West Midlands appears to have dropped slightly during April, although "Western" and Hymek diesel-hydraulic locomotives still make sporadic appearances, despite the ban on locomotives with this form of transmission on the LMR. The 9.10 Paddington–Shrewsbury and 13.46 return, on Mondays, is a particular candidate for diesel-hydraulic power, although No. D1036 was similarly employed on April 20 and No. D1064 worked the 7.40 Birkenhead–Paddington between Chester and Wolverhampton on March 27. Following the closure of Shrewsbury Coleham yard on April 5 as part of the scheme to concentrate Midlands–West of England/South Wales freights on the Birmingham–Bristol line, Brush Type 4s now run light between Shrewsbury, Wellington and Stafford to pick up LMR–South Wales trains, including the 9.45 Stafford–Margam Class 7 and 18.10 Stafford–Llandilo Junction Class 6. The line from Wellington to Stafford is new territory for this type. "Britannia" Pacifics returned to the West Midlands fairly regularly during April with the re-institution of the 9.12 (TuThSO) Wellington–Willesden empty vans from April 8; another "Britannia" Pacific, No. 70042, worked a party special from Chester to Stratford-upon-Avon on April 8. On April 19 a Poole to Stratford party special was powered throughout by SR light Pacific No. 34089. At least seven "Hall" Class 4-6-0s remained active on freights in the Wellington area during April, but Oxley's fleet of "Castle" and "Grange" 4-6-0s is being superseded by Stanier and BR Standard Class 5 4-6-0s.

Freight traffic on the Madeley Junction (Salop)–Buildwas branch is increasing, most of the trip workings from Wellington being in the hands of Stanier 2-8-0s. Block loads of slack from Trentham to Hollinswood for the existing Buildwas power station run via Madeley Chord, Market Drayton and Wellington, but when the new Buildwas power station is completed merry-go-round operation is contemplated; however, if slack haulage from Trentham is to continue, a new spur at Madeley Junction on the GW main line just north of Shifnal would be desirable to avoid reversal. English Electric Type 4 diesel No. D333 (5A) was employed on crew training runs on the Tyseley–Stratford-upon-Avon direct line during April. Bushbury shed closed in April and its allocation was transferred to Oxley.

A "Clan" Pacific was a notable visitor to the Rochdale–Oldham branch on March 31 when No. 72008 had charge of the Carlisle–Oldham empty van train; as this train is routed via Heywood it was probably the first visit by a member of this class to the Central Lancs line. The Pacific returned north on the afternoon Ancoats–Carlisle freight instead of the normal Oldham–Carnforth parcels. BR/Sulzer Type 4 diesel No. D81 (D16) was employed on Easter excursions on April 17 and 18 which ran from intermediate stations on the Oldham branch to the Lancashire coast. Most of the holiday specials were worked by local power, including trains from the NER, which were almost exclusively in the hands of Stanier and B1 4-6-0s. The number of excursions to the Lancashire coast resorts during the holiday was almost halved by comparison with 1964.

(For LMR information we are indebted to Messrs. R. Foxon, P. J. Plant, P. Blakes, R. Wallis, J. M. Howell, R. G. Thorne, G. D. Greer, M. Wood, P. Hillock, T. A. Bailey, D. I. Besser, D. R. Thornhill, D. T. J. Rollason, S. Grounds, S. J. Spells, E. N. Pounder, M. R. Hall, M. L. Farrer, R. S. Greenwood, D. L. Smith, B. Roberts, J. Owen, N. Medley, C. D. Rodway, J. Harrison, M. Clark, I. Harvey, T. Ropley, W. D. King, D. Haines, J. D. Munro, K. Stewart, S. R. Howarth and the East Warwickshire Locomotive Society.)

Eastern and North Eastern

The last of the English Electric Type 2 small "Deltics", Nos. D5901/7, returned to the Eastern Region after engine modifications during April, although so far No. D5901 has not been reported in service. At least 12 Brush Type 2 diesels have been re-equipped with English Electric 1,470 b.h.p. engines and re-classified under the ER's domestic classification as 14/2. The numbers of the locomotives thus modified are given in the accompanying "Motive power report".

The freight collision at Great Chesterford during the first week in April involving a block car-carrying train led to the diversion of a number of GE line trains via the GN main line and to the appearance of a large number of GE-allocated Brush Type 2s at Hitchin in the period April 5 to 10. A Stratford-based Brush Type 2, No. D5695, worked a special train for the Hudson Bay Launch Co., which included one of the former "Devon Belle" ex-Pullman observation cars, from Kings Cross to Hull on April 4 and back on the following day. The locomotive on this occasion had white painted buffers and warning panel.

Steam has not quite vanished from the southern end of the GN main line for isolated light engine trips by Class B1 4-6-0s, presumably running to and from steam heating-duties in the London area, were still being reported in April. As steam locomotives are no longer diagrammed to work to March or Whitemoor, the coaling plant at March depot was taken out of use on April 19 and demolition has commenced.

Shirebrook diesel depot is now complete and was expected to be commissioned officially at the end of April, although it had been in use for some weeks beforehand. The new depot is expected to be fully operational by June with an allocation of about 50 locomotives, including shunters at present based at Langwith, which is then likely to close. Tinsley's Clayton Type 1 diesels have been transferred to Staveley Barrow Hill and are believed to be employed on duties formerly carried out by Class 4 2-6-0s and 0-6-0s.

LTS line multiple-unit diagrams are reported to have been recast for the summer service to reduce the LTS requirement, to allow the strengthening of some GE line services, and to cover the April return to the LM Western Lines of the LMR a.c. units on loan to the GE Lines for about four years. Through excursions from North West London to Southend continue to run at Bank holidays; on April 19 BR/Sulzer Type 2 No. D5028 (1A) headed a Northampton Castle–Southend Central train and sister locomotive No. D5236 (2E) had charge of a Bedford–Southend Central excursion.

Brush Type 4 diesels have taken over a number of through diagrams between the North Eastern and Western Regions. This has resulted in the appearances of Landore and Bristol-based members of the class in Leeds and Newcastle, among them the recently-named D1662 *Isambard Kingdom Brunel*, which was noted at Leeds City on April 30.

Diesel and electric multiple-units and ordinary BR standard coaches allocated to the North Eastern Region are being given "NE" prefixes to the coach numbers instead of "E" as hitherto. In contrast, Great Eastern-based vehicles, which for a few years have carried "GE" prefixes are now reverting to "E".

The NER has raised the maximum speed limit on several sections of the East Coast main line to 100 m.p.h. The sections concerned are from Shaftholme Junction to Brayton North Junction, Barlby North to Naburn, Skelton Junction to Cordio Junction Northallerton, Northallerton North to Darlington South and Darlington Crossing to Durham Relly Mill—a total distance of about 75 miles. With the 51 miles approved for 100 m.p.h. running in the Eastern Region the East Coast route now has about 125 route miles where three figure speeds can be reached.

Latest arrivals at Thomas' scrap yard at Beighton, Sheffield, have included six "Jubilee" 4-6-0s Nos. 45554/80, 45617/63/72/89. The report in the April issue that "Coronation" Pacifics Nos. 46245/51 had gone to Sheffield for breaking up was incorrect as these two locomotives were dealt with earlier in the year at Cashmore's yard at Great Bridge. Among arrivals at King's yard at Norwich for cutting up during April were three Class A3 Pacifics, Nos. 60062, 60106 and 60112.

(For E and NER information we are indebted to Messrs. R. A. Errington, R. W. Fisher, F. J. Billings, D. Burrows, G. W. Jackson, P. Conray, O. M. Arkroyd, A. R. Howe, D. Williams, L. Parsons, M. J. Forey, A. Brodard, P. M. Forrow, A. Ellis, I. N. Bruce, D. J. Luesby, L. Field, F. P. Walker, E. Yates, R. D. Potts, D. Pendleton, A. L. Hodgetts, N. J. H. Walker, N. A. Collins, C. I. Wright, R. J. I. Corden, "Phred", B. White and the Durham Railway Society.)

Western

Old Oak Common crews are undergoing training on English Electric Type 3 diesels, possibly as a preliminary to the introduction of this type working in multiple-unit on high-speed Paddington–South Wales or Paddington–West of England services later in the year. Meanwhile other WR diesel types continue to be beset by troubles (including, it is believed, unforeseen vibration problems on the Brush/Sulzer Type 4s which may result in temporary derating to 2,300 b.h.p.), resulting in transfers of locomotives away from their normal routes. Paddington–Birmingham services, for example, have reverted in a few cases to diesel-hydraulic traction with both Hymek Type 3s and "Western" Type 4s, but on April 9 "Warship" Type 4 No. D819 was most unusually employed on the 18.10 Paddington–Wolverhampton. A few of the Swindon-built Type 1 diesels have been in trouble with loose tyres.

Three-car suburban diesel multiple-units working in the London area are being fitted with inter-coach gangways within the unit, partly to give all passengers toilet access and partly to facilitate the issue of tickets by guards on certain services. Most of the coaches are of the open pattern internally despite the provision of side doors to each seating bay, and the conversion involves little structural alteration other than the opening cut into the end wall.

The Easter holiday period saw a large number of reliefs from Paddington and,

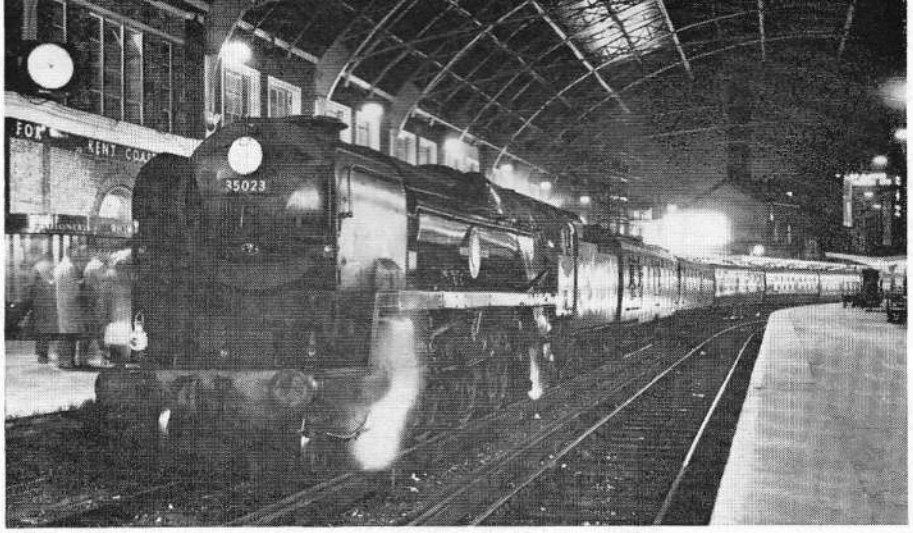
as on previous occasions, additional locomotives to power the relief trains worked up in tandem on ordinary services. Several unusual diesel pairings were reported, including "Western" and Brush Type 4s on up South Wales trains and a Brush Type 4 and Hymek Type 3 on an up Worcester service. Most of the down reliefs were booked for Brush Type 4 haulage.

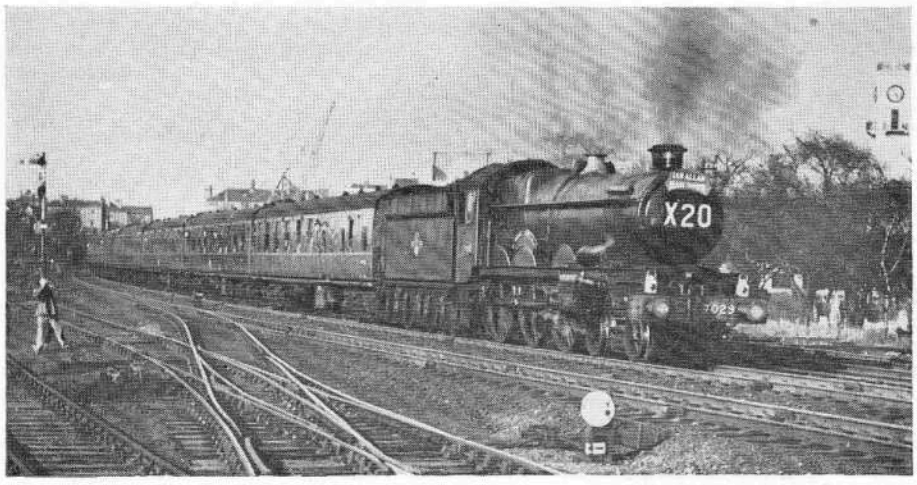
A correspondent commenting on the report of "Britannia" Pacific No. 70053 at Paddington on March 1 confirms that it in fact powered the 16.20 Paddington–Banbury via Didcot—one of the occasions that the 16.15 Paddington–Bicester–Banbury and the 16.20, normally a diesel multiple-unit formation, exchanged stock because of exceptional demand on the latter train.

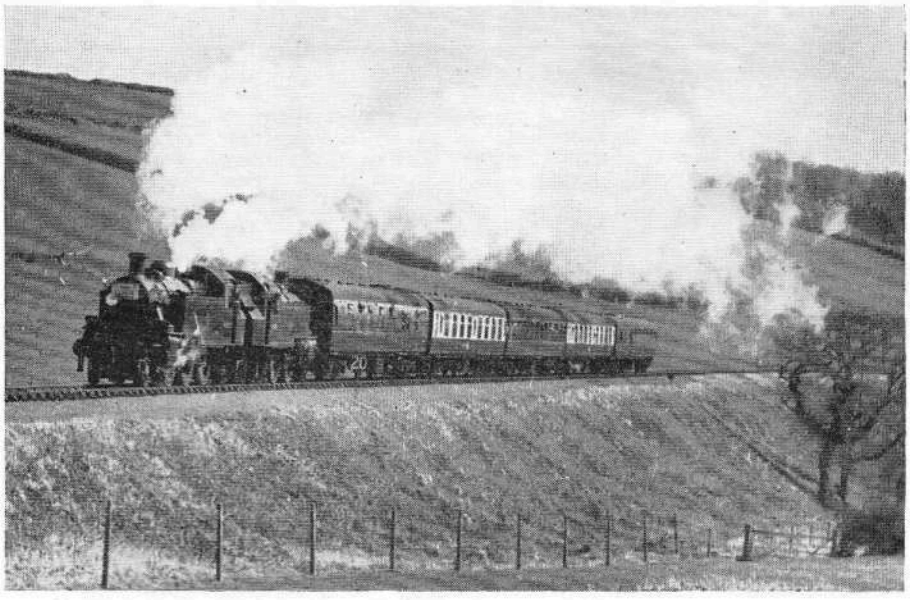
From the beginning of March all but two of the remaining steam trains between Birmingham New Street–Worcester Shrub Hill and Gloucester Eastgate were taken over by Brush Type 4 diesels. Brush Type 4s are now employed on Worcester–Oxford line freights. Two regular steam-powered freights still survive between Chippenham and Swindon—one the 22.15 Bristol–Banbury as previously reported, and also a morning Taunton–Banbury freight. Another train occasionally steam worked is the evening Swindon–Gloucester–Cardiff parcels.

Non-available BR/Sulzer Type 4 diesels presumably resulted in the re-appearance of a "Jubilee" 4-6-0 at Bristol on April 10, when No. 45675 was employed on the 11.53 York–Bristol, and the visit by English Electric Type 4 No. D384 on the 7.32 Derby–Bristol on Easter Sunday. On the following day, Stanier Class 5 4-6-0 No. 45006 powered a Wolverhampton–Weston-super-Mare via Stratford-upon-Avon excursion and the 8.25 Smethwick–Weston-super-Mare was in the charge of "Hall" class 4-6-0 No. 7929. The empty coaches of both trains were worked forward to Bridgwater and both locomotives continued on to Taunton. On April 24 the 9.53 Birmingham New Street-Paignton relief was worked as far as Bristol by Stanier Class 5 4-6-0 No. 45086. The WR have confirmed that the withdrawal of Hymek Type 3 diesel No. D7089, reported in last month's issue, was a mistake on the official lists and that it should have been shown as reallocated to Bristol Bath Road.

Bristol Barrow Road shed continues to be a reception centre for withdrawn steam locomotives from the West and South of England destined for South Wales scrapyards. By the end of April eight SR locomotives, including "Merchant Navy" Pacifics Nos. 35001/24 and "West Country" Pacific No. 34031, had arrived from Eastleigh. Meanwhile at Barry Dock at the end of April no fewer than 119 locomotives—a large proportion of them former Southern







Top: SR "Merchant Navy" Class 4-6-2 No. 35023 *Holland-Afrika Line* after arrival at Victoria on March 28 with an excursion returning from Templecombe via the SR West of England main line and East Putney. *Photo by B. Stephenson*
Centre upper: An Ian Allan excursion leaves Leicester Midland behind a WR 4-6-0 No. 7029 *Clun Castle* on its return journey from Birmingham to London on March 27. *Photo by J. Goss*
Centre lower: A train touring North Devon on March 27 nears East Yarde, on the Halwill Junction–Torrington line, behind Class 2 2-6-2Ts Nos. 41206 and 41291. *Photo by C. H. S. Owen*
Bottom: The preserved Class A3 4-6-2 No. 4472 *Flying Scotsman* approaches Peterborough North on April 10 with a special train organised by its owner, Mr. A. F. Pegler, for men of Darlington works. *Photo by B. Stephenson*

locomotives, including "Merchant Navy" Pacifics Nos. 35006/9/18/25 and 12 light Pacifics, also Great Western "King" Class 4-6-0s Nos. 6023/4—awaited breaking up at Woodham's scrap yard. "Britannia" Pacific No. 70030 hauled a train of condemned coaching stock from Stourbridge throughout to Llanelly on April 27.

At the beginning of April there was a marked increase in the use of steam locomotives on freight and parcels trains west of Cardiff to cover Brush Type 4 diesels redeployed elsewhere, to the extent that for a time there were more steam workings than before the onset of full dieselisation last November. The types used included Standard 2-10-0s, Stanier and 28XX 2-8-0s, Class 5 and "Hall" 4-6-0s 72XX 2-8-0Ts and 56XX 0-6-2Ts. The last steam locomotive to be built for BR, No. 92220 *Evening Star*, withdrawn for preservation, is in store at Cardiff East Dock and has been marked to ensure that it is not sold for scrap. Withdrawal is believed to have arisen after the engine was involved in a collision in which its frames were buckled behind the buffer beam.

A derailment on the South Wales main line between Cardiff and Bridgend on April 3 resulted in the diversion of all trains over the coast line via Barry. On April 21 a diesel shunter belonging to the Steel Company of Wales was derailed on the main line outside Margam depot; the down "Capitals United Express" headed by "Western" diesel No. D1060 was hauled by a BR diesel shunter at low speed through Margam yard to avoid the blockage.

Steam power returned to former SR lines west of Salisbury during the Easter holiday period when a number of relief trains worked through to Exeter behind Standard Class 5 4-6-0s or Bulleid Pacifics. The 13.00 Waterloo–Exeter on April 15 reached its destination over an hour late behind "West Country" Pacific No. 34012, which had taken over from a failed "Warship" diesel between Basingstoke and Salisbury. Exmouth Junction shed, which was expected to close early in April, was nevertheless still at work over the Easter period and was providing 0-6-0PTs for banking work between Exeter St. Davids and Central and an Ivatt 2-6-2T for at least one passenger train, the 13.52 Axminster–Exeter on Easter Monday. Diesel multiple-units returned to the South Devon branches during April, replacement units having been obtained by transferring cars from withdrawn services elsewhere on the WR.

A Birmingham/Sulzer Type 3 diesel now has a regular diagram west of Salisbury on Mondays to Fridays; the locomotive works a morning Salisbury–Yeovil freight and returns to Salisbury with a parcels train in the afternoon. On Saturdays the freight does not run and the up parcels turn is covered by the steam locomotive from the previous evening's Salisbury–Yeovil parcels. Birmingham/Sulzer Type 3 diesel No. D6523, however, worked west of Yeovil on April 4 when it headed a train of empty ballast hoppers from Woking to Meldon Quarry as far as Exeter Central. The locomotive returned east light later in the day. Another member of the class, No. D6549, was reported heading south with a freight on the Somerset & Dorset line at Templecombe on April 17. On April 6 a "Western" Type 4 diesel ventured into new territory when No. D1036 worked a ballast train from Menheniot Quarry to Crewkerne. It later ran round the empty ballast wagons and returned to Exeter.

(For WR information we are indebted to Messrs. A. K. Courcher, B. Harrington, P. N. Herbert, R. W. Lomer, S. J. Woods, J. R. E. Moreton, T. M. Andrews, R. Newman, J. H. Williams, S. Vickers, P. W. Gunstone-Holman, A. J. Syme, M. J. Prowse, D. J. Beckett, J. G. Beer, G. R. Harris, G. H. Davies, G. Turnham, S. M. Hardy, P. McLean, C. M. Napper, J. A. Ainsworth, A. Hunt, D. J. Jones, D. Tebbutt, R. J. Semmens, A. Chatfield, A. T. Morris, M. Lewis, M. Flynn and J. Follows.)

Southern

The Bournemouth–York and "Pines Express" trains continue to be steam-hauled between Oxford and Bournemouth, the former usually by a GW "Hall" or "Grange" 4-6-0. But during April, Stanier Class 5 4-6-0s monopolised the York train, including Nos. 44832 (5B), 44835 (16B) 44915 (1E) and 45207 (55D). On April 20 No. 45006 worked a relief to the "Pines Express" through to Bournemouth. The Southern operating authorities evidently appropriated at least one of the Stanier Class 5s, for No. 44915 was reported on a number of occasions during Easter week on Waterloo–Bournemouth services, including the 15.30 down on April 19 and a down evening parcels on April 24. On April 15 standard Class 5 4-6-0 No. 73080 powered the 9.55 Bournemouth–Wolverhampton Low Level relief as far as Oxford and returned south with first part of the "Pines Express", the 9.45 Liverpool–Bournemouth. During the holiday period "Merchant Navy" Pacifics were in greater profusion on Waterloo–Bournemouth line reliefs but by the following weekend the power position had declined to an extent that nothing larger than standard Class 5 4-6-0 No. 73119 was available to take the down "Bournemouth Belle" on April 25, which passed Basingstoke about 30min late.

A Stanier Class 5 4-6-0, No. 44695 (56D), was among visitors to Weymouth in recent weeks when it arrived on March 24 with a special parcels train; it returned north light later the same day. WD 2-8-0 No. 90686 (8F) was an even more notable visitor at Weymouth on March 18, having arrived with a perishables train from Wigan. It remained at Weymouth for several days and performed local duties, including the Weymouth station pilot turn. Weymouth depot was so short of power at the end of March and the beginning of April that Ivatt 2-6-0s were being employed on Bournemouth and a few Westbury turns. Meanwhile Bournemouth has received about 12 more standard Class 4 2-6-4Ts from Eastleigh, Exmouth Junction and Redhill sheds to help out its lighter steam duties. English Electric Type 3 diesel No. D6938 worked through to Weymouth in place of a failed Hymek Type 3 on a Bristol train on April 20.

SR Birmingham Sulzer Type 3 diesels are extending their range of duties; one now powers a local freight between Bournemouth and Wareham and others have turns in the Fratton area. During the Easter weekend the through Brighton–Bournemouth service was provided by Hampshire three-car diesel multiple-unit No. 1133, a surprising move for such a lengthy journey since only one of the three coaches has toilet facilities. Engineering works on April 25 at Swaythling led to the diversion of Waterloo–Southampton line trains via Guildford, Havant and Fareham; most were in the hands of Bulleid light Pacifics.

The Reading–Redhill line had its first rostered steam passenger working since January on April 13/14 when Class 4 2-6-0

motive power report

THIS list is correct to the following dates: LMR, March 27; ER, April 17; NER, April 24; ScR, April 24; SR, April 12; WR, April 11.

MOTIVE POWER DEPOT CHANGES

Closed to steam: Watford (1C) on March 29.

NEW LOCOMOTIVES

2,750 h.p. Diesel-electric Co-Co: D1670/1/2-86A; D1817/21/2/3/4/5/7/8/9/30-D16; D1826-D16, then to D15; **1,750 h.p. Desiel-electric Co-Co:** D6971-86E; D6972-86A; **1,250 h.p. Diesel-electric Bo-Bo:** D7534/5/6/7/8/9-D16; **650 h.p. Diesel-hydraulic 0-6-0:** D9536/7/8-86A.

LOCOMOTIVES REALLOCATED

London Midland Region: W/E March 6: 4125-2A; 42730, 42848, 42900-9B; 44658-8F; 44810-5D; 44859, 45052/8-2J; 44877, 45154, 45212-8C; 44888, 44926-9H; 44918, 45221-8F; 45294, 45340-12C; 45422-5D; 48029, 48129, 48296, 48303-8A; 48115, 48546-9F; 48163-8B; 48189, 48425/57/76-8C; 73025/90-6D; 73033/8/96-5E; 75051/7/8/9-10G; 78007/23-9G; 78037/57-10D; 92028-2D; D43/67/9, D134-2E;D164-D15; D2742-Crewe Works; D4111-1F; D5298-2E; D5383-ML; D7519/20-2E.

W/E March 13: 4151-2C; 44043-16E; 44675-10C; 44806, 45059, 45407-8C; 45190, 45267/89-16C; 48127-16G; 48180, 48382, 48530/45, 48637/45, 48759-15B; 48303, 48678/94-16E; 76080/1/2/3/4, 90148-8G; 92048/9/53/5/8/9/70/8/86, 92116/9/24/6/56/60/3-8B; D5084-1A; D7519-D16.

W/E March 20: 42886/92-10H; 44462, 44597-12D; 44714-5D; 44779-8F; 48464-9L; 48515/43/57-9G; 48735-8E; 75011/5/7/9/39/41/2/4-10G; D1826-D15; D5811-2E.

W/E March 27: 42225-12E; 42230-9E; 42442-10D; 44587-9L; 48024/65, 48185, 48361, 48528, 48637/45-15A; 48221, 48704-8B; 76036/42/7/86/7/8-2F; D2867, D3782/3-10D.

Eastern Region: W/E March 20 (additional): D5844-41A; D5855-LMR.

W/E March 27: D5612-34G; D5686, D5828-LMR; D5811-41C; D5855-41A.

W/E April 3: 61039/51/93-36A; 61050-36E; 61145-40E; 61370-40B; 90069, 90401, 90719-41H; D5541-41A; D5552, D5685/98-34G; D5692, D5851-LMR; D5828-41C; D5857-32B.

W/E April 10: D1568-31B; D5556/9-30A; D5662/3-32A; D5686/92-41A; D5842/4/55-LMR; D5851-41A; D8604/5/6/7/8/9/10/1/2/3/4/5-41E.

W/E April 17: 90248/74, 90381, 90493, 90516-36C; 90533, 90669/89, 90718-36E; D5660/2/3/4, D5860-34G.

North Eastern Region: 4 weeks ending March 27: 44056-55D; 48093, 48146, 48274, 48473-55B; 62024-52F; 62026/30-52G; 65790/5/6, 65802/5/9/12/3/4/21/5/42/58-52F; 65817-52G; 65823/46-50A; 90030-50B; 90362-55G; 90377, 90650-55D; D238/9-51L; D390/1/6/7/8-52A; D1574-ER; D1766-55A; D2067/9/78/99-51A.

4 weeks ending April 24: 45593, 45664-55A.

Scottish Region: 4 weeks ending March 27: 65912/20-62C; 80005/45-66F; D2742-LMR.

4 weeks ending April 24: 61147-62B; 65915-62A; 65929-62C; 80123-66A.

Southern Region: Period ending April 12: 73037/92/3-70D; D2179, D2294, D3042-70D.

Western Region: 2 weeks ending April 11: 4992-82E; 5605/59/77-LMR; 5932-82E; 6691-87F; 6973/84-82E; 7249-88A; 7253-86E; 73037/92/3-SR; 73068-82F; D1669-86A; D2129/83-87E.

LOCOMOTIVES WITHDRAWN

3642, 3796, 3865, 5200, 6128, 6995, 30548, 31620, 34010/4, 41293, 42060, 42179, 42299, 42430/47, 42567, 42680, 42832/41/8/96, 43037/67/90/2, 43144/8, 43952/94, 44125/95, 44211/63/6, 44347, 44456, 44527, 44741, 45194, 45286, 45378/80/7, 45512/89, 45602, 45726, 47442/52, 47564/77/8, 48027, 48409, 60016, 60527, 60961, 61198, 61215/21, 61310, 62047, 63378/91, 63717/41, 63842/77, 63902, 65808/22, 65933, 75007, 80003/35/90, 80149/53, 90059, 90120/3/31/6/64/88, 90202/25/46/67/84, 90317/99, 90419/26/42/96, 90556/61, 90626, 92003/38/44, 92140/70/8, 92220/2/36.

AMENDMENT

May Issue: Western Region: 2 weeks ending March 7: 92000/7/38-85B should read 92000/7, 92238-85B; **3 weeks ending March 28:** add D7089-82A. **Locomotives Withdrawn:** delete D7089.

LOCOMOTIVES RECLASSIFIED

D5520-6/8-33/5-9/42-55/8/60-99, D5600-44/6-76/8-83/5-99, D5800-34/6-40/2-7/9-62 now Class 12/2; D5527/34/40/1/56/7/9, D5645/77/84, D5841/8 now Class 14/2; D5835 now Class 16/2.

No. 76011 and Class 4 4-6-0 No. 75069 respectively powered the 6.50 Reading–Redhill because of track relaying near Wanborough, which disorganised the normal d.m.u. diagrams. Failures among the hybrid units 1201–6 led to the use of Oxted line units Nos. 1306/15 on Reading–Redhill–Tonbridge services on a number of occasions during April and a WR diesel-mechanical multiple-unit was also employed on at least one occasion on a Reading–Redhill service. A number of regular steam-hauled freight services survive on the Reading–Guildford line, including the 7.10 and 9.00 Guildford–Reading, the 9.14 Blisworth–Redhill vans as from Reading, the 13.33 Reading–Guildford freight and the 9.18 Feltham–Guildford vans, formerly diagrammed for diesel haulage. The latter train was regularly powered by a standard Class 4 2-6-4T during the week before Easter.

A Liner train made a test run on the South Western Division during the last weekend in April, when Brush Type 4 diesel No. D1820 worked a 900-ton 15-car train and dynamometer car from Derby to Eastleigh via Acton, Feltham and Woking on April 24 and returned north on April 27.

(For SR information we are indebted to Messrs. N. Kendall, D. T. J. Rollason, P. Braithwaite, F. A. R. Trevone, R. G. Austerberry, M. Toulouse, K. Wood, "35028", M. J. Venn, R. Godfrey, T. E. Rymer, F. G. Thomas, R. M. Crabb, P. D. Holmes, K. D. Ware, P. Davies, D. G. N. Murch, M. Haywood, N. Remnant, A. Wright, C. D. Bennett, R. G. Francis C. J. Fawcett-Kircher and D. Denton.)

Scottish Region

Aberdeen Ferryhill lost another of its A4s in April, when No. 60016 was condemned after sustaining damage to its motion and its middle cylinder at Glamis. The diesel locomotive sent to assist the ailing A4 added to the damage by colliding with the A4's tender. Another Ferryhill A4, No. 60034, was at Darlington works in April for overhaul, thus leaving only eight A4s available for traffic at Ferryhill, although only two trains between Glasgow and Aberdeen are now diagrammed for Ferryhill A4s, the 7.10 and 13.30 from Aberdeen and the 17.30 and 23.00 from Glasgow. Nevertheless shortage of diesel power led to the use of substitute steam power in the Aberdeen area on both West and East Coast routes to the south at the end of March and early in April.

The Paxman-engined NBL Type 2 diesel No. D6123 was out of service at Perth in April awaiting attention to its engine and possibly the fitting of a replacement. The last day of operation at Dundee West brought an unusual visitor, BR/Sulzer Type 2 diesel No. D5144 (1A), which took out the 12.00 to Glasgow Buchanan Street on a fill-in turn between overnight trips from and to the south.

(For Scottish Region information we are indebted to Messrs. D. Lamond, "70008", D. W. Smith, P. Depledge, I. G. Maclean, G. Mackenzie, I. M. Mitchell, D. C. White, M. Clayton and R. J. W. McGregor.)

Workshops

Brush Type 4 diesel No. D1734, officially condemned, was reported to be in Crewe works undergoing repair during April. The latest examples of Brush Type 4s under construction at Crewe at the end of April had reached D1676-81 and D1842-79, while the latest from Brush works at Loughborough was No. D1841. At Swindon construction of Paxman-engined Type 1s had reached No. D9555; the latest in service was D9542. It is reported that nameplates bearing the name *Media* have been cast for use on EE Type 4 diesel No. D226.

(For Workshops information we are indebted to Messrs. A. Wyn Hobson, D. H. Delany, D. R. Stopher, D. J. Jones, J. H. Sparkes, G. R. Hounsell and B. R. Tunnard.)

the Irish scene

Edited by L. Hyland

CIE

THE summer timetable of CIE will this year extend from June 14 to September 19. Apart from the revised Belfast service the most noteworthy alterations are to the Sunday services. On the Sligo line there is, for the first time, a regular Sunday train from Dublin Westland Row at 10.30. Up to August 15—the end of the Lough Derg pilgrimage season—this returns in two portions at 15.20 and 19.10. The latter, which continues throughout the summer timetable, is for normal week-end and tourist traffic, but the former is to serve the pilgrimage traffic which on weekdays is catered for by retiming last year's 10.05 Sligo–Dublin to 13.55. There is, however, no extra down service on weekdays, as it is expected that the regular 09.25 will be able to cater for the ordinary and the pilgrimage traffic. The Sunday 10.30 to Cork this summer will run as a Cork and Kerry train taking connection at Mallow out of the retimed Rosslare–Cork express, the 11.00 from Rosslare Harbour. This has the two-fold advantage of affording a Dublin–Tralee Sunday service and of providing a Rosslare–Killarney link, which in previous summers was supplied by the 10.15 Cork–Mallow – Killarney – Tralee – Fenit. This train, nevertheless, continues to run as it attracts day trip and seaside traffic to Fenit. It is remarkable in that it is the only passenger train of the week on the Fenit branch, which otherwise operates goods only as required, spasmodically for the discharge of vessels using Fenit Pier and for sugar beet during the season.

The service on the Dublin–Belfast main line was improved from April 12. The previous service comprised four down trains (five on Saturdays) from Dublin and five up trains from Belfast on weekdays. Of these, two were "Enterprise" expresses in each direction, one worked by CIE and one by UTA. The new schedules provide for six down and seven up trains, of which four are expresses at 8.30, 11.00, 14.30 and 17.30 down and 8.00, 11.30, 14.00 and 17.30 up. The new early morning trains should go a long way to recapturing business traffic, which had been deterred by the slowness of the ordinary morning trains in each direction and the lateness of the 11.00 down and 10.30 up "Enterprise" expresses. Equally, the 16.45 ex-Belfast, altered on January 15 to 17.10, is improved by a 17.30 departure, which enables a Dubliner to do a full day's work before returning home. The 2hr 10min timing is standard on all the new expresses, despite Portadown stops of the 14.30 down and 14.00 up and a Dundalk stop on the 17.30 down. The 14.30 ex-Dublin makes a cross-city connection from Belfast, York Road to Coleraine and Londonderry possible, for which the previous 14.45 could not be relied upon. Conversely the 11.30 up takes connection out of the 8.35 Londonderry–York Road, which the previous 10.30 from Great Victoria Street did not. In addition, the 14.00 and 17.30 up suit arrivals from Londonderry, somewhat mitigating the disadvantages ensuing from the Portadown–Londonderry closure.

Ex-GNR locomotive No. 85 *Merlin* was moved from Inchicore to Amiens Street shed on March 29 and it is expected that shortly she will be hauled to Belfast. No. 85 is to be placed in the Belfast Transport Museum, thus virtually filling the remaining space in the Witham Street premises available for large exhibits. *Merlin* is the only remaining example of the GNR V class compound 4-4-0s of 1932.

Work on the Rosslare Harbour car-ferry terminal mentioned in the January issue is now entering its final stages. The roadway from Ballygeary—the landward end of the viaduct—across the viaduct to the pier is now complete. At the pier tunnels curve 90deg to give side access to the *St David;* tidal variations are overcome by a variable ramp at the tunnel mouth.

UTA

Steam operation on the UTA system has shrunk since the closure of the Portadown–Londonderry line in February. The new timetable on the Dublin–Belfast line calls for the use of only one UTA BUT railcar set and as all other workings including the cross-border goods trains are handled by CIE locomotives, there is a spare set even after the redeployment of Londonderry line cars on the Belfast–Portadown local services. The only use of steam at present is pilot duties at Portadown and Belfast Great Victoria Street and York Road, and on the lines linking the Belfast docks with the NCC section. This last-mentioned section is likely to show the greatest concentration of steam trains during the summer peak, as excursions and probably some of the regular summer scheduled services will be steam-hauled. The UTA is understood to be retaining 23 locomotives, as follows: the 18 2-6-4 tanks; the ex SL&NCR 0-6-4T No. 27; 0-6-0s Nos. 48/9; 4-4-0 No. 66; and 2-6-0 No. 97, which has just emerged from Duncrue Street shops fitted with new cylinders. The retention of Nos. 26 (0-6-4T), 170, 171, 174 and 207 (4-4-0s: GN numbers) is also likely, but more for their use on a temporary basis or, in some cases, for spare parts.

Since the closure of the Portadown–Londonderry line on February 14 the clearing up of remaining wagons has been completed and the line has lain derelict. Feeling has run high, however, and protests continue to be made regarding the inadequacy of the replacement road services, although the express buses from Dublin to Londonderry and Letterkenny appear to be slightly better patronised. Whether through sheer vandalism or as a protest, Strabane station was damaged in March. Meantime, the CIE goods trains from Dublin, two to Belfast and two to Londonderry, continue to operate. The former are worked by CIE locomotives throughout while the latter are hauled by a CIE diesel, usually a 950 h.p. B141 class Bo-Bo, between Dublin and Lisburn, where a three-coach multi-purpose railcar set of the UTA takes over for the run via Antrim and Coleraine to Londonderry. Intermediate traffic is not catered for and Belfast and Londonderry are the only regular freight depots open.

new books

Books reviewed in this feature and published in the United Kingdom are available from Ian Allan Ltd., Mail Order Department, Terminal House, Shepperton, Middlesex, at the price shown, plus return postage.

SWITZERLAND'S AMAZING RAILWAYS (Third edition). By Cecil J. Allen. *Thos. Nelson.* **42s (post 1s 6d).**

A fresh edition, resplendent in a full-colour jacket, with a considerable number of new illustrations and an additional chapter, testifies both to the popularity of Switzerland and the repute of Cecil J. Allen's work as one of the outstanding railway books of the modern era. The standard of production remains as high as in previous editions. In his added chapter, Mr. Allen describes first the numerous large-scale improvements currently in progress on the conventional railways and excites envy with a mention of the still profitable performance of the Swiss Federal Railways; in part this is the reward of enterprise, in part the outcome of sensible road-rail passenger service integration, but perhaps Mr. Allen does not make quite enough allowance for the system's fortunate middle-man position astride streams of heavy international traffic, of which the Swiss enjoy highly remunerative frontier-to-frontier haulage, and which they monopolise on the freight side since international lorries are barred from using Switzerland purely as a transit route. The rest of the new chapter is a graphic account of the latest additions to the country's host of mountain-climbing cable lines, which strike progressively higher into the snows with ever longer and more frightening leaps from pylon to pylon. Will there come a day, one wonders, when a Swiss mountain top will seem naked without its *Luftseilbahn* terminus and adjacent hotel?

M.N.

THE FUTURE OF BRITAIN'S RAILWAYS. By Roger Calvert. *Allen & Unwin.* **35s (post 1s).**

After the Beeching Report, The Calvert report. The name of the Honorary Secretary of the National Council of Inland Transport is now familiar through its frequent appendage to letters published in the national press. From those, which so frequently appear to pin all responsibility for decline of BR traffic and the contraction of the rail system on Dr. Beeching personally, the burden of this book can be imagined. "Beeching confronted", in fact, is a tag Mr. Calvert's publishers are using in their promotion. Basically, though, it is not Dr. Beeching that Mr. Calvert is trying to confound but the public preference for motor transport in any situation where it appears cheaper and more convenient. If one starts from the assumption that the country must of right have a railway network broadly related to some general standard of population density, no matter what other environmental factors affect the public's free choice of transport media, one cannot cavil at a good deal of the argument in this book. Certain of the suggestions propounded for improved services, new methods and new equipment have a good deal of merit (though some are decidedly eccentric and in not a few BR have anticipated Mr. Calvert in the interval between writing and publication), provided they are considered out of any context but that of a neatly ordered railway network as an end in itself. But even in a society that was rabidly pro-railway, those responsible for disbursing the funds to undertake new works would want some evidence of market research to prove that the facilities would be reasonably used and an appraisal of the likely costs. On these vital aspects, Mr. Calvert has very little to say.

M.N.

BRITISH RAILWAY STATIONS. By J. Horsley Denton. *Ian Allan.* **15s (post 10d).**

Thought-provoking, informative, and well illustrated with photographs and plans, but unhappily without an index, this unique work gives proof of its author's erudition and lively mind. Yet the approach to the subject (passenger stations only) is sometimes amateurish. Much space in the 63 pages is devoted to the traffic aspects of passenger station working and much to railway history; much more is wasted in tabulating information. Despite a punctilious regard for truth there are a few strange inaccuracies. The book has its place as desirable reading for railway traffic staff, besides historians and laymen interested in passenger train operation. The rapid pace of passenger station closures makes it a valuable contemporary record of BR operations and practice in the mid-1960s.

H.S.

CAREERS IN SIGNAL ENGINEERING

British Railways Southern Region have vacancies for

DRAUGHTSMEN
TECHNICAL ASSISTANTS
ENGINEERING ASSISTANTS

In their Signal and Telecommunications Engineering Department at Wimbledon, which will move to East Croydon later in the year. The modernisation programme including the Bournemouth Electrification project and the developments now taking place in railway signalling and telecommunications offers interesting work with excellent prospects of promotion.

New entrants will be engaged as trainees and given three months' training. Successful candidates will work on circuit design and on the preparation of schemes for signalling and telecommunications work.

Drawing office or railway experience is desirable but not essential. Applicants should have Ordinary National Certificate in Electrical Engineering or equivalent.

Day release will be given to candidates wishing to obtain the Higher National Certificate in Electrical Engineering.

Sandwich course Studentships for Engineering Students are available for applicants with suitable General Certificate of Education "O" and "A" level subjects.

Commencing salary will depend on educational qualifications, experience and age, and will rise in accordance with National Agreements to £1,345.

Free and reduced rate rail travel. Thirty-eight hour five-day week. Additional pay for overtime. Contributory pension scheme.

Please telephone Waterloo 5151 extension 5685 or write to the Chief Signal and Telecommunications Engineer, British Railways Southern Region, Wimbledon Station, London S.W.19.

British Rail | Southern Region

CLASSIFIED ADVERTISEMENTS

Announcements in this column cost 1/- per word and should be prepaid. Displayed Classified Advertisements accepted at £3 0s. 0d. per column inch.

Closing date 5 weeks prior to 1st of month of publication.

Copy and remittance should be sent to:
Arthur H. Wheeler & Co.,
St. Stephen's House,
Victoria Embankment,
London, S.W.1.

THE NATIONAL COUNCIL on Inland Transport seeks to promote a healthy transport policy in Britain. Enquiries are invited for literature, advice, etc., to the Secretary, at 35/37 Queensland Road, London, N.7.

HAMILTON ELLIS's new book "Splendour of Steam". Sixteen of his superb coloured paintings, including GW King, LMS Duchess and T9, are brought to life in what will become the most prized of all the Ellis books. 63s. Colour prospectus from Allen & Unwin, 40 Museum Street, London, W.C.1.

RAILWAY/STEAM Traction/Tram/Canal literature, Old/New. List 4d. Callers welcomed. Pinder, 13 Forfield Place, Leamington Spa.

"RAILROADIANA" lists American Books, including B & O Power 115/-, From Cab to Caboose 54/-, Kansas West 53/3, Rails Across Midlands 69/3, Rutland Road 77/6, Ships & Narrow Gauge Rails 47/3, Smoke across Prairie 39/-, Some Classic Trains 152/9. S.A.E. to Leonard Clyde, Box 7, Six, The Mount, Ewell, Surrey.

THE PROPRIETORS of British Patent No. 701483 are prepared to sell the patent or to license British manufacturers to work thereunder. It relates to "Improvements in or relating to Articulated Railway Vehicles". Address: Boult Wade & Tennant, 112 Hatton Garden, London, E.C.1.

RAILWAY FILMS for sale. Available 16 mm and 8mm. Illustrated catalogue 6d. M.F.S., 12 Central Road, Worcester Park, Surrey.

IAN ALLAN LTD. have a Vacancy for an assistant in their Book Production Department. Previous experience in book production, typography, etc., would be a great advantage. This is a position with scope for a person with initiative and drive. Ian Allan Ltd., Terminal House, Shepperton, Middlesex.

MODERN RAILWAYS

is printed on

"GALART" Machine Coated Paper with an Esparto Body

as are

MANY OTHER QUALITY AND TECHNICAL PUBLICATIONS

Made exclusively by

JOHN GALLOWAY & CO LTD

BALERNO

Midlothian

Telephone: BALERNO 2254
(3 LINES)

Telex: 72-217

WORLD ENQUIRIES SOLICITED

JOHNSTON
ENGRAVING CO. (1924) LTD.

FOR QUALITY BLOCKMAKING

WITH EXPRESS SERVICE

36-37 COCK LANE·SNOW HILL·LONDON·EC1
Telephone-CITY 6681

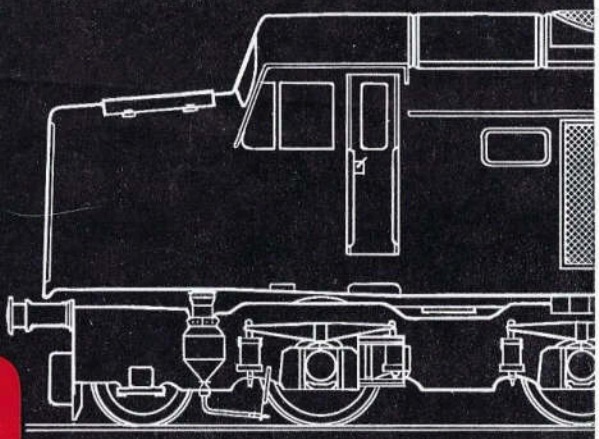
why do so many young people bank with

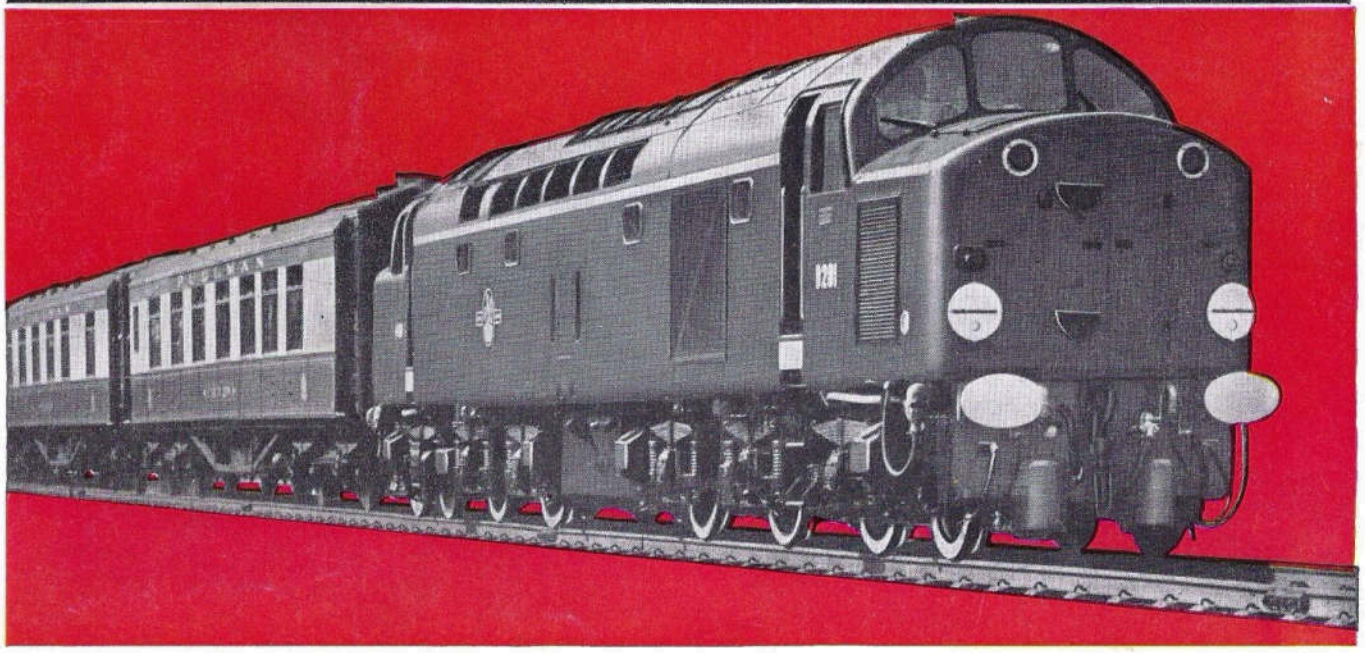
NP

1 Articled Clerk, Ian MacDonald, looks forward to the day when he is fully qualified and can set up business on his own—he will doubtless find the possession of a bank account very useful in this important venture.
2 Stone mason Bob Bellamy's salary is now paid monthly. His firm pays this direct into his account at N.P.
3 Painter, Robert Wallace, with a wife and two children, runs his own decorating firm and finds the possession of a bank account essential to keep his affairs in order.

NATIONAL PROVINCIAL FOR UNDERSTANDING AND FRIENDLY ADVICE

NOW 80,000,000 ~~58,000,000~~ miles





The two hundred Type 4 2,000 h.p. diesel-electric locomotives supplied by 'ENGLISH ELECTRIC' to British Rail have now completed more than 80 million miles.
This exceeds the total mileage of all other Type 4 diesel-electric locomotives on British Rail.

EXPORT!
'ENGLISH ELECTRIC' SELLS IN 140 COUNTRIES

'ENGLISH ELECTRIC'

DIESEL AND ELECTRIC TRACTION

TRACTION DIVISION, THE ENGLISH ELECTRIC COMPANY LIMITED, ENGLISH ELECTRIC HOUSE, STRAND, LONDON W.C.2.

TD.105B

Published by Ian Allan Ltd., Terminal House, Shepperton, Middlesex, and printed in the United Kingdom by Staples Printers Limited at their Stratford, London, establishment